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Battelle Technical Review

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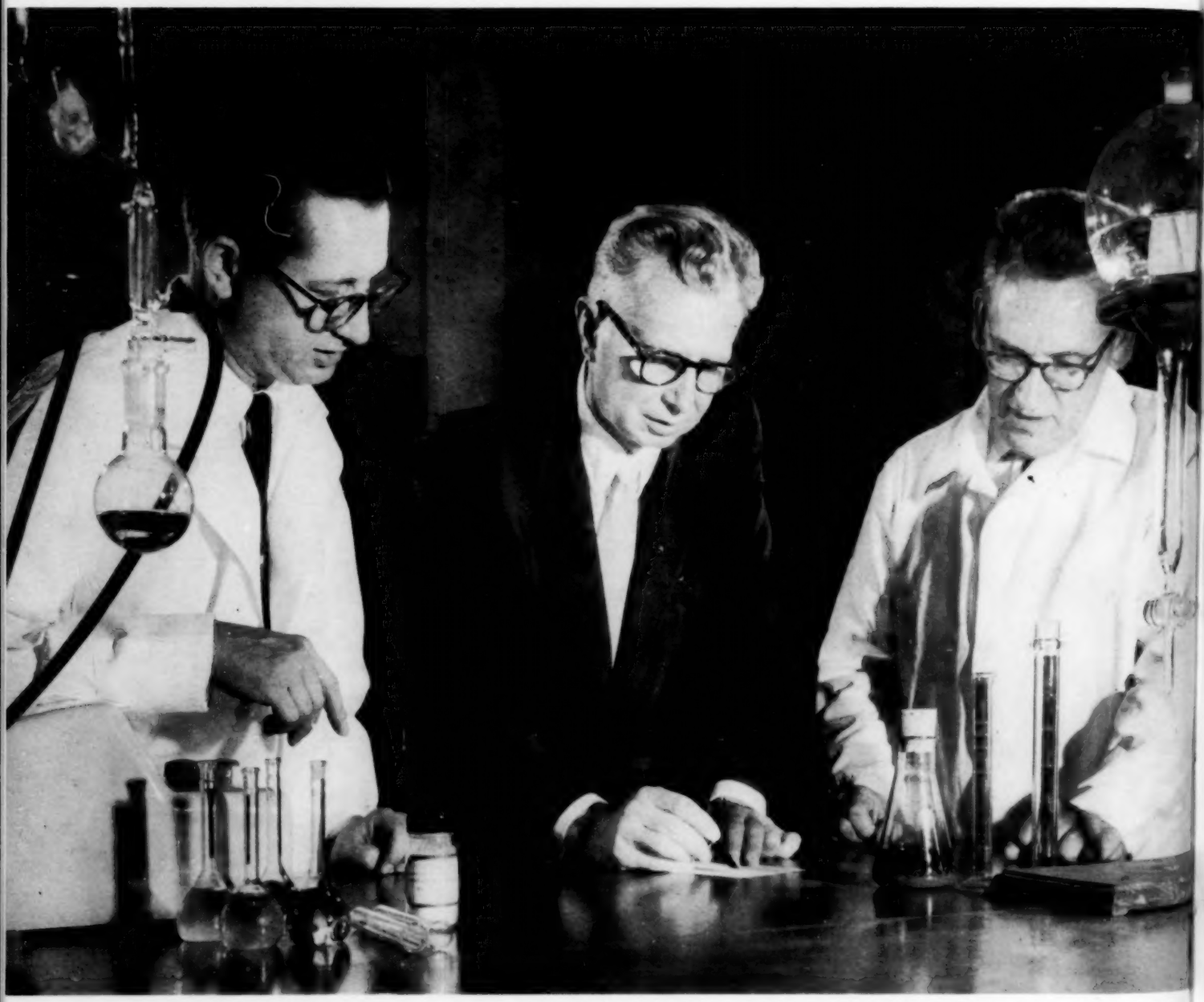
Research for High-Speed Aircraft

How bodily chemical substances may affect mental health is a problem receiving intensive study. One promising approach is to learn what happens when psychomimetic compounds, which induce psychotic behavior, are introduced into the body. Pioneers in the preparation of such compounds are Battelle chemists (l. to r.) Richard O. Morin, Edward L. Kropa, and Fred Benington. Their research, carried on cooperatively with Fels Research Institute, has led to the synthesis of new β-phenethylamines and N,N-dialkylamides. The work is jointly supported by The National Institute of Mental Health, Wright Air Development Center Aero-Medical Laboratory, and Battelle.



CHEMISTS TEAM FOR MENTAL HEALTH STUDY

Volume 6, Number 8
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BATTELLE TECHNICAL REVIEW

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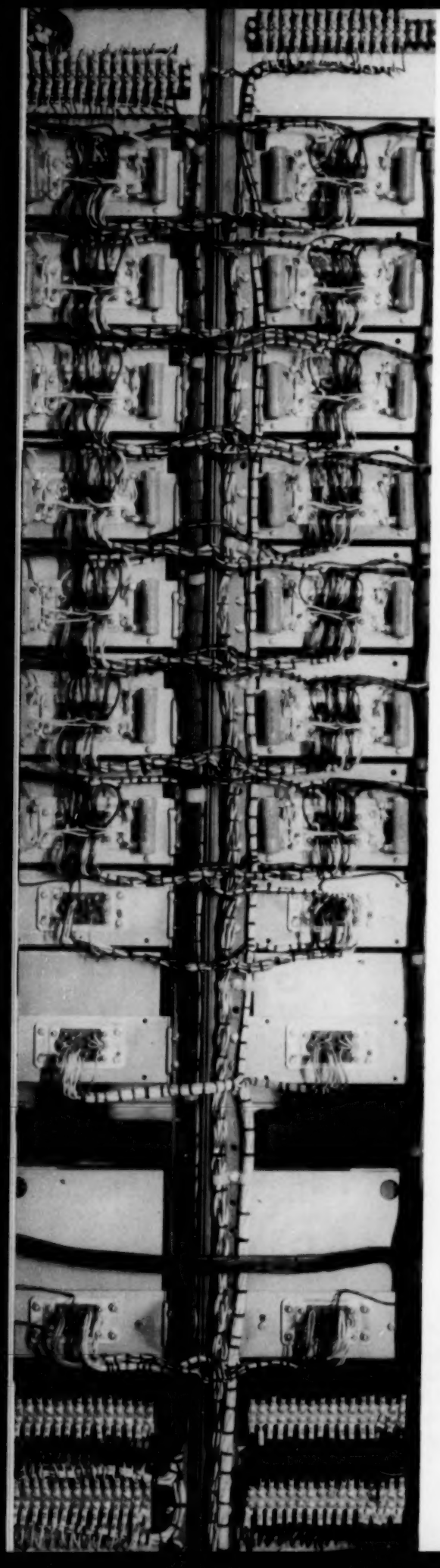

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Abstracts of articles and papers in a wide variety of technological fields from more than 1350 journals published throughout the world. Abstract selection largely reflects the primary areas of Battelle research.

Technology and Social Problems

"WHILE THE CREATION and distribution of our material production create social problems of themselves, science and technology have increased and compounded these problems by an almost explosive growth in the past 25 years . . .

"This astounding growth of scientific activity has been estimated (by the AAAS) as fifteen fold in adjusted dollars and almost equally in number of active scientists from 1930 to the present . . .

"This vast increase in scientific and engineering effort has greatly decreased the time required to make new discoveries available to the consuming public. Whereas, before World War II, five to ten years were required to go from the laboratory to the market place, less than half this amount of time is now a normal expectation . . . Frequently, both bench-scale laboratory work and pilot-scale manufacturing will proceed simultaneously so that the development will be available more rapidly. Research and development have become such an integrated and deliberate part of our technical society that each organization that is part of the chain of any particular development is now better equipped to handle changing conditions, and the trial periods for empirical experience have been reduced or eliminated.

"With this speed-up in technological development, new pressures are generated. Less time is available to condition the using public to the proper use of new devices. More capital investment is required . . .

"As with the distribution of capital, this rapid growth has not been uniform or consistent in all branches of science and engineering. The physical sciences have been developed much more rapidly than the biological sciences, and applied research has received far more attention than basic research. This raises serious questions as to whether we are aware of the possible implications for human existence of some of our developments . . .

". . . A scientific or engineering solution [to these problems] is not necessarily adequate or complete, and [engineers] must examine the social and economic effects as well . . ."

Excerpts from "After Engineering—What?" An address by Edward E. Slowter, Battelle vice president, presented at the 1957 Convention of the Ohio Society of Professional Engineers.

VIGNETTE

PHYSICAL METALLURGIST

ERVIN E. UNDERWOOD

Missiles, atomic energy, and jet planes are only three of the factors intensifying demands for metallurgical materials with high-temperature properties that are now almost unavailable. To make the most of present alloys, states Ervin E. Underwood, physical metallurgist at Battelle, new approaches to the study of the behavior of metals are called for. He believes that one promising approach to an understanding of the basic mechanisms affecting deformation of complex modern alloys at high temperatures has two aspects: (1) the study of simple high-purity alloys to get a clear picture of the mechanisms and (2) the making of careful quantitative measurements so that the amount and distribution of the constituents in the alloy can be known.

Erv's present research is concerned with the fundamental behavior of metallic materials at high temperature. In its pursuance, he is pioneering in a number of areas. He has under development currently a method of correlating short-time hot-hardness values with long-time creep data which he believes may eliminate the need for much creep testing and which may make possible the rapid determination of creep and tensile strengths at varying temperatures.

He is also guiding and participating in the development of techniques in the field of quantitative metallography. These techniques are aimed at enabling metallurgists to study such factors as particles, bulk phases, and voids, on a quantitative basis and thus get a more definitive picture of alloy structures. A significant discovery from this work is that an anomalously large proportion of precipitate is found in alloys when present as small particles, as compared with the amount of precipitate calculated from phase diagrams. Another of his fields of interest is the effects of particle shapes and sizes on the creep process. His studies have shown that unusual strength may be imparted to alloys by widely spaced particles.

Erv has reported on his research findings in numerous published papers and technical talks. He enjoys active membership in the American Society for Metals, the American Institute of Mining, Metallurgical, and Petroleum Engineers, and the Institute of Metals (British).

In preparation for his research career, Erv studied first at Purdue University, where he received his B.S. in metallurgical engineering. Both his M.S. and D.Sc. in physical metallurgy were received from the Massachusetts Institute of Technology. After World War II, he retired as a major after serving overseas with the Office of Military Government. Later, Erv worked with the Carnegie-Illinois Steel Company as a metallurgical observer.

Erv and his wife Marlit are kept busy by three active small sons. Yet, Erv manages to maintain his musical interests, play golf, and hold a high chess rating.

Research for High-Speed Aircraft

by SAMUEL A. GORDON

The aviation industry is now facing its third speed barrier, the "Thermal Thicket", which calls for engineering beyond the knowledge now available. The author believes that surmounting this barrier calls for new materials and new research approaches and techniques which will hasten the solution of troublesome problems.

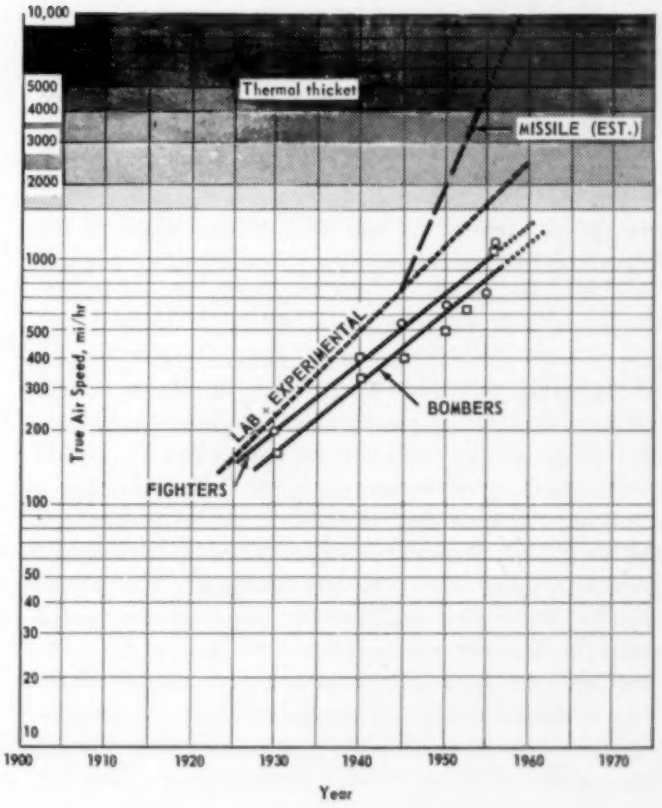
THE HISTORY OF FLIGHT has been a record of accomplishments not exceeded in any other technological field. From the early Wright Brothers' work to the modern Satellite projects represents a span of 55 years, which is indeed a very short period when we consider the progress made during this time.

The first powered flight attained an altitude of a few feet for a duration of about 12 seconds at about thirty miles per hour. Last year, the X-2 flew to 120,000 feet at a speed in excess of 2,000 miles per hour. The Wright Brothers' engine weighed about 16 pounds per horsepower and developed 12 horsepower. A modern reciprocating engine weighs about one pound per horsepower and develops as much as 3500 horsepower. Jet-engine weights are down to 0.2 pound per pound of thrust and develop more than 20,000 pounds thrust. The first airplane weighed less than 500 pounds, whereas the B-36J has a gross weight of over 400,000 pounds.

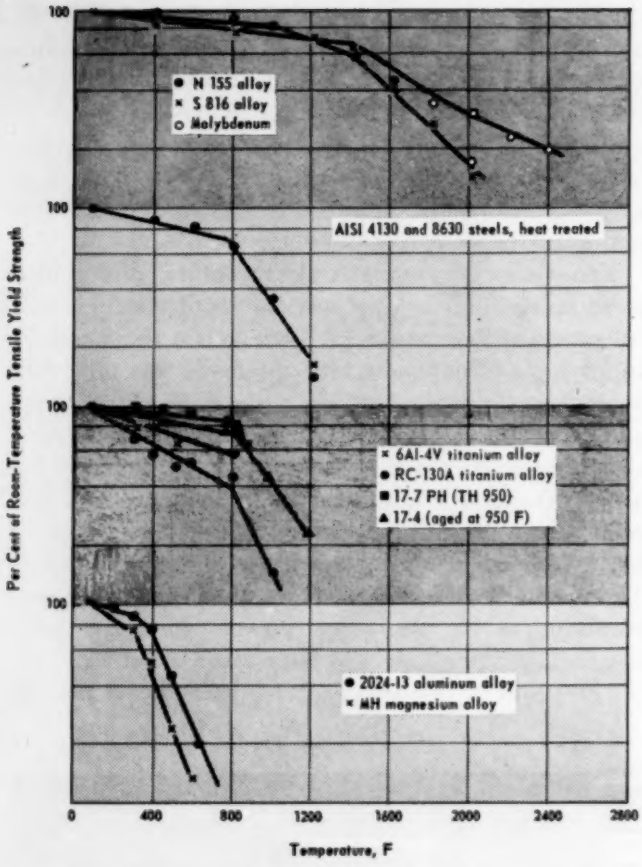
A brief analysis will show just how such rapid developments came about and what fields of technology made the greatest contributions. The three predominant technologies involved in aircraft development have been power plant, aerodynamics, and structural analysis. Of these three, power plant requirements had continually restricted the speed of flight. However, technological break-throughs, such as the development of turbojets and rockets, came at opportune times.

Knowledge of aerodynamics, stability, and control were accelerated by the availability of wind tunnels. As progress was made in these areas, the need for supplying a structure to take the loads was not really acute. It was always possible to use available materials and to refine methods of design sufficiently to meet structural requirements, not only in the airframe but also in engines. Progress in the development of aluminum and steel alloys resulted in the state of the art being somewhat in advance of the engineering needs. This fact allowed shift of research and development emphasis to be placed on power plant and aerodynamic problems, where they were needed.

The result of this approach has brought us through



Trends in the speeds of fighters, bombers, and missiles from about 1925 to the present, with extrapolations beyond 1960. The curve "Lab and Experimental" is included to show approximate development times for planes during the period. The number of years shown on the horizontal lines between "Lab and Experimental" and "Fighters" or "Bombers" suggests the increasing time required for design and other operations that precede production as the speeds of planes rise.



Effects of temperature on the tensile yield strength (0.2 per cent offset) for typical alloy systems.

two speed barriers. At one time, it was believed that it would be impossible to fly a propeller-driven vehicle over 500 miles per hour, and to pass the sound barrier. We are now at a third barrier, through which there is probably no passing, except by space flight. We call it the "Thermal Thicket". In reaching this new barrier, our weapon-systems planners are required to forecast new weapons even though the technological requirements necessary to create them are not discernible at the time. Thus, we find that an old wheel is now yelling for grease. Structural-design criteria and materials previously used are no longer adequate, and we are rapidly developing engineering requirements far beyond the knowledge available from the state of the arts involved. This is true in spite of the fact that a high degree of design sophistication has been obtained through material versatility, particularly with the aluminum alloys.

The Materials Problem

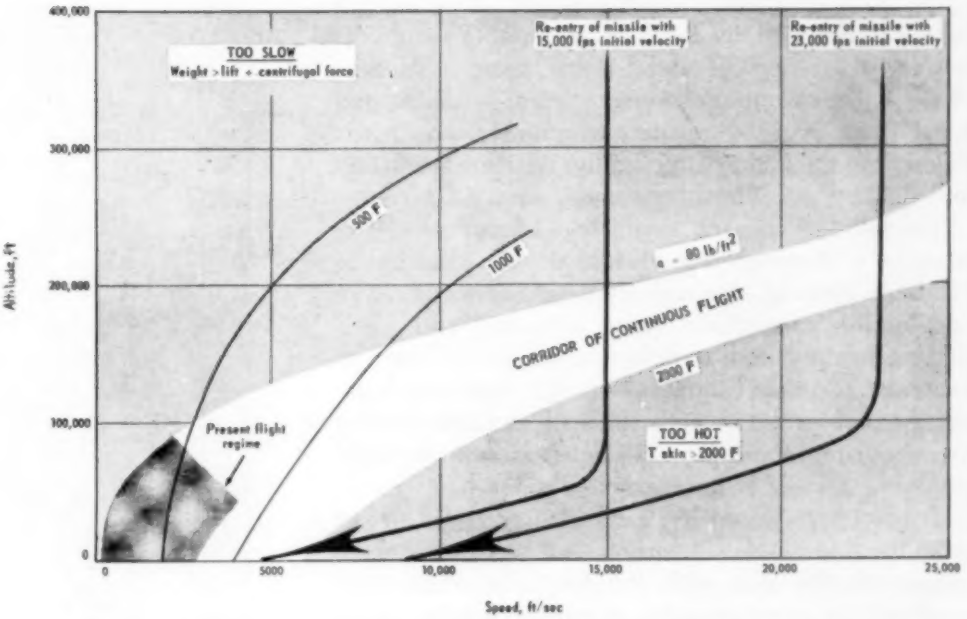
To understand just how the temperature problem is related to an airframe structure, let us first look at the short-time elevated-temperature strength of some vehicle materials. The chart on this page shows a decided drop in strength at 400 F for aluminum and magnesium alloys, but it is known that at temperatures well below this value (300 F) the materials are thermally unstable. Titanium, the precipitation-hardening stainless steels, and the ferritic steels show the sharp fall-off at about 800 F. The superalloys may have a useful strength up to 2000 F but they show the fall-off at about 1400 F.

Since the aluminum alloys represent the basic material for airframe application, it has become customary to identify the beginning of the Thermal Thicket at a temperature where this material becomes impractical. At 40,000 feet altitude this sets a speed limit for sustained flight of something over Mach 2 for stagnation temperatures. On the same basis, it appears that sustained temperatures over 800 F will phase out stainless steels and the titanium alloys, while about 1400 F will phase out most of the superalloys. This means that Mach 4 appears to be the maximum permissible speed that can be expected for sustained flight with present available materials, assuming all other problems are solved. These speeds can be increased if temperature alleviation can be attained by insulation or cooling, or a combination of both.

A method of showing the operating conditions of flight suggested by D. J. Masson and C. Gazley, Jr. is shown on page five. The corridor of continuous flight is defined by the dynamic pressure considered necessary for lift and by the temperature limitations of the material under equilibrium conditions. The present flight regime is identified by the cross-hatched area.

The article presented here is based upon the author's keynote address presented at the recent symposium of the National Aircraft Standards Committee in Dallas. Mr. Gordon, who is concerned with problems of design engineering, is primarily interested in the relating of materials to applications where efficiency is a primary consideration. In addition to extensive work in airframes and missiles, including the applications of high-temperature materials, he has participated in rough-terrain landing studies and the design of roof structures, vehicles, and packaging. The author is currently a member of the Advisory Committee for Simulated Service of the American Society for Testing Materials. He is also a member of the High Temperature Task Force ANC-5, which prepares high-temperature design criteria on behalf of the Bureau of Aeronautics, the Air Force, and the Civil Aeronautics Administration.

Note how narrow the corridor becomes as the limiting temperature is reduced. Missile flight as identified by the two missile curves, however, indicates that the temperature limitations of materials can be ignored to a certain degree by proper programming, since a transient-temperature condition exists. This figure indicates the potential development in flight speeds and altitudes that is possible with present material limitations and how little of this potential has been exploited. On the basis of the adjoining chart, it appears that the rapid progress made with missiles has not been duplicated for manned vehicles (at least up to the present time). Judging from this evaluation, it should be deduced that the greatest effort in the next five years should be applied to extending the state of the art in the field of sustained flight, both manned and unmanned.



The corridor of continuous flight. It is defined by the dynamic pressure considered necessary for lift and by the temperature limitations of material under equilibrium conditions.

An understanding of the Thermal Thicket in terms of material exposure clearly points to the kind of research required for the state of the art to remain ahead of the engineering requirements. Two major fields of investigation are evident: (1) deformation of materials under load and temperature and (2) the integration of the thermal properties of materials with vehicle flight programming.

Much research has been done in the past on short-time elevated-temperature tests. This information is necessary and useful. Much has also been done in creep of materials at temperature, but this work has been directed primarily toward a criterion applicable to engine design and not to airframe design.

When one realizes that the yield strength of a material can be reached at a total deformation of one per cent or less, it becomes obvious that creep values above deformation rate of one per cent are not usable as a design criterion. In fact, several aircraft companies have indicated the need for creep data much below this value.

The thermal properties of materials become as much a part of structural design as do the mechanical properties. Heat transfer from the surface of the skin to airframe interior results in stress gradients that must be considered.

In cases where joint insulation against galvanic corrosion is required, the normal organic coatings are no longer usable at temperatures higher than 500 F. Differential expansion due to material differences or temperature differences can also seriously inhibit a design.

To extend the speed capabilities of a vehicle beyond the limitation defined by the wall temperature, it is necessary either to insulate or cool the structure. Insulation is satisfactory only when sustained flight at a given speed is limited. Any attempt to increase this flight time will be at the expense of increase in gross weight of the structure. In order to maintain the temperature of a ¼-inch aluminum plate at a point below 200 F for one hour of flight at Mach 3 at altitude, 0.3 pound of insulation will be required per square foot of exposed affected area. To cool the same surface would require about 2.5 tons of refrigeration per square foot of exposed area. For sustained flight of a manned vehicle, it will obviously be necessary to provide refrigeration in the occupied area, but for the rest of the structure (particularly the wings, tail surfaces, and unoccupied fuselage structure) it might be more efficient to allow the material to heat up and design the structure accordingly. If this plan is followed, we have not, of course, alleviated the need for developing or improving materials for high-temperature exposure, as far as continuous flight is concerned.

Digressing for a moment from manned vehicles to missiles, it is noted that speeds and altitudes have been attained that are far greater than for manned vehicles.

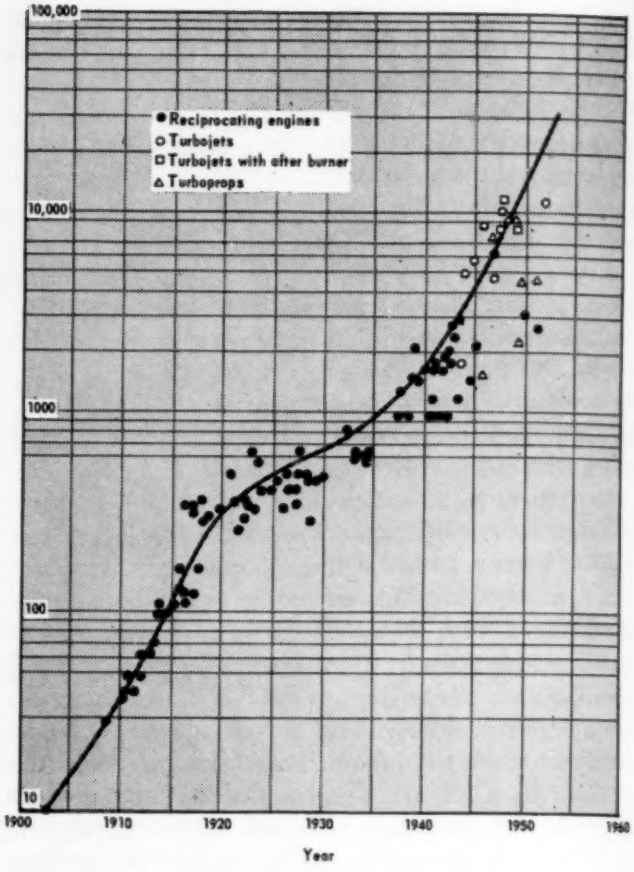
Up to the present time, the progress in missiles has not been handicapped by the lack of suitable materials. Rather, it has been accelerated by taking advantage of the known thermal characteristics of available material, because of the transient temperature conditions inherent to the flight path of a missile. Here insulation and thickness of skin surfaces offer easy solutions.

The trend of research, then, should be obvious: (1) develop a thorough knowledge of the behavior of available materials throughout their full temperature capabilities, particularly under sustained and intermittent loading and at deformations below one per cent, and (2) direct intensive effort toward determining the best weight compromise with available materials, associating their thermal properties with the flight program of each system under consideration.

To stop here would leave an incomplete picture of what the future holds for structural components. Again comparing the past with the future, we note that modern high-speed operational vehicles employ rather thick aluminum plates of large dimensions, long extrusions of complex shapes, and large, intricately machined forgings. This trend has contributed markedly toward very efficient structures with a minimum number of joints. The future supersonic vehicle will be constructed of high-temperature-resistant alloys, such as titanium or the precipitation-hardening stainless steels, with densities greater than aluminum. For at least the next two years, these materials will be limited to sheet sizes, and extrusions and forgings will be slow in meeting the designer's requirements. As a result, we will be back to the bits and pieces where fastening techniques will increase in importance, not only from the fabrication point of view but also from the material point of view. The days when material development automatically produced a fastener are gone. Today we are attaching titanium and stainless steel sheets with small low-strength Monel or titanium rivets and, as yet, we do not have an approved high-strength high-temperature threaded fastener for airframe application. This is indeed a rather bleak outlook!

Other Problem Areas

So far this discussion has been centered around time-temperature requirements. This is natural, since the temperature regime represents the greatest obstruction to current and future development. Other problems, however, need some discussion, such as the influence of fuels, nuclear radiation, solar and cosmic radiation, subambient temperature, high-frequency noise, and many other environmental problems associated with advanced performance. Many of these are



Growth in engine-thrust horsepower since 1903.

being worked on at the present time with varying degrees of intensity. Some are being pursued with logic and some with the shot-gun approach. Other programs base their philosophy on past precedence, which are no longer applicable in the new environment, ending up with unusable information. Thus, much research effort results in inefficient use of manpower and facilities, to say nothing about the costs.

In these new areas of unknowns, it appears that the most desirable approach would be first to establish a set of environments or objectives and to determine the order in which they should be met, and then to work up a program toward specific goals. Before execution, however, it is necessary to anticipate the probable conclusions or results and to ask two questions: (1) Are these the type of answers that are needed and at what time is the information required, and (2) how and when will the information be applied? The answers to such questions might result in a complete revision of the original concept and approach to the research effort. The old adage in research that "information is perishable" applies here. Thus, needless costs and the duplication of effort will be a direct function of the intelligent scheduling of these problem areas.

In the consideration of aerial vehicles in the regimes of speed, altitude and temperature as discussed here must be translated into environments in which materials and systems must function satisfactorily. For convenience in treatment, these environments have been classified by Air Research and Development Command into two categories, natural environments and induced environments. Natural environments are defined as being independent of the vehicles while the induced environments result from the operation of the vehicle and its reaction with the natural environment. Following is a classification of the natural and induced environments which affect piloted vehicles and missiles operating in the spectral performance bands previously described:

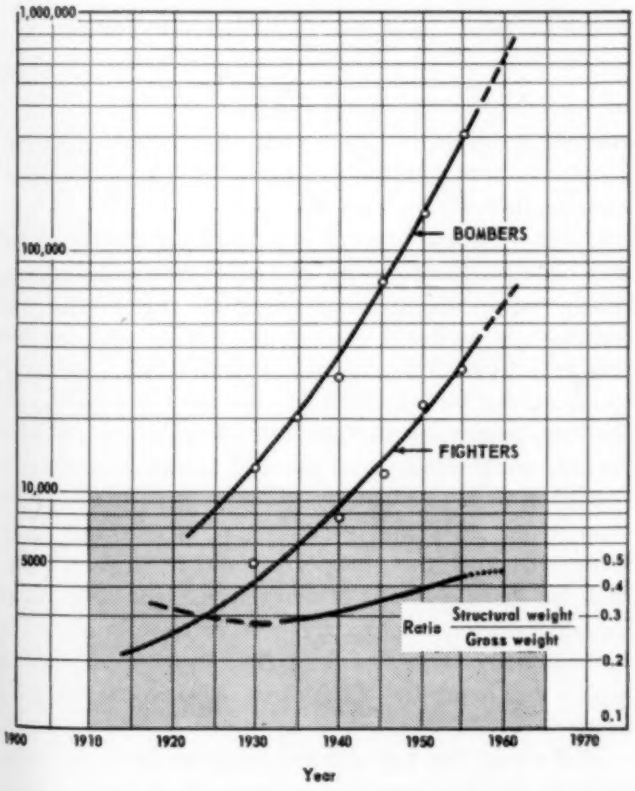
Natural Environments

Altitude
Solar and cosmic radiation
Rain, sand, and dust erosion
Humidity, salt spray, ozone
Biological—bacterial and fungal growth
Low temperature

Induced Environments

High temperature
Thermal shock
Noise and vibration
Nuclear radiation
Explosive atmospheres
Acceleration
Mechanical shock
Corrosion—fuels, rocket gas, etc.

In the field of creep, the past precedence for determining creep data has been to report constant creep rate and stress. This procedure comes from the need for measuring creep in stationary boilers and turbines where deformation determined tolerances, and design criteria required no cognizance of the elongation involved at failure. Most materials exceed two per cent total deformation before reaching the secondary creep stage. In airframe structures, the material is no longer usable in this time range. Thus, a new concept must be formed and the direction of research revised.



Trends in the gross weight of bombers and fighters (in pounds) since World War I days. The lower curve also shows the changing weight of airframes during the same period.

The case of nuclear radiation is of interest in thinking of the order of research. At the present time, there is no clear picture of what the airborne nuclear power plant will be, but it is generally conceded that its early, if not only, application will be on large subsonic vehicles. Should research on material to be exposed to this environment be carried on without a better knowledge of its application, or should it be based entirely upon the assumption that this development will go on unchanged?

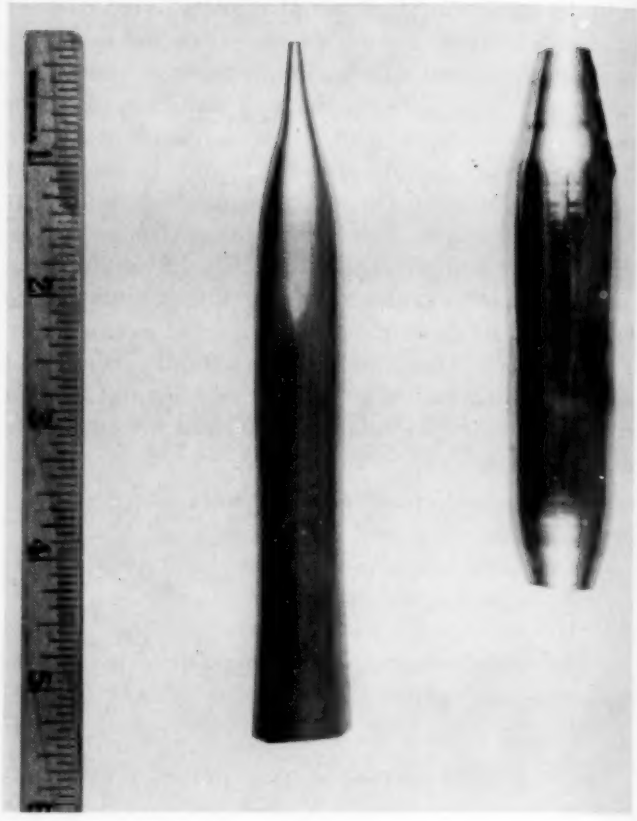
In order to judge the requirements for the future, a general recapitulation of the whole history of past performance of missiles and airplanes would be required. It is in order, however, to make some rational predictions on the basis of very recent occurrences. For instance, only last year the X-2 attained a speed of Mach 3 plus and an altitude of higher than 125,000 feet. Since the exposure, however, was for a matter of seconds, the next objective would be to consolidate this gain by increasing this exposure to minutes and hours. The new X-15 is being designed to exceed the speed of the Mach 5 and to attain an altitude of over 200,000 feet. This will again be a matter of seconds. The next step then is to increase this to minutes if not hours.

With these goals come a host of problems which must be solved. How soon? As soon as human capabilities will allow under carefully planned programs in areas of development disclosed by logical reasoning. Other methods take too long and cost too much. How much should we spend? Not so much as to price ourselves into destruction, but enough to prevent our destruction.

New Semiconductor Materials

by ROBERT K. WILLARDSON

The established semiconductor materials will soon be complemented by compound semiconductors now under development and evaluation in laboratories. The appeal of these newcomers lies in their different properties, wider ranges of application, or more moderate cost.



The single crystals of aluminum antimonide (center) and silicon, shown here, are the basic material for semiconductor devices. Each crystal must be painstakingly drawn from molten material. Crystals of this size, when cut, furnish enough material for about 10,000 devices.

WHAT DOES THE FUTURE HOLD in store for us as new magic evolves from the use of semiconductors? In recent years, the term semiconductor has become increasingly familiar. Almost every television set has a semiconductor diode. Many of the new auto and portable radios are either partially or completely transistorized. The new "electronic brains" are much smaller because of the use of semiconductor components. Throughout the electrical industry, new "midget size" silicon power rectifiers are beginning to replace the old bulky ones. In the years to come, these inroads into our electrical way of life will continue to expand at an ever-increasing rate, mainly because of the development of new semiconductor materials.

Germanium and silicon are by far the best known semiconductors, but in the next few years such intermetallic compounds as indium phosphide (InP), gallium arsenide (GaAs), and aluminum antimonide (AlSb) will find important applications, especially for rectifiers and transistors which must operate at high temperatures. Devices utilizing the galvanomagnetic effects in germanium have been suggested, but the high electron mobilities in indium antimonide (InSb) and indium arsenide (InAs) will make them practical. Electronic refrigeration has long been a dream; new semiconductors like bismuth telluride (Bi_2Te_3) or lead telluride (PbTe) may soon make this dream come true. The photovoltaic and Seebeck effects, long laboratory curiosities, are now vying for commercial importance as methods of converting solar and nuclear energy into electrical power. Infrared is challenging radar as the best method of detecting enemy tanks, gun emplacements, and aircraft. Semiconducting compounds are the heart and brain of infrared optics and detecting systems. This is, therefore, an appropriate time to appraise the situation, to discuss these new semiconductors, their properties, and to assess the outlook for the future. It is certain that the new intermetallic semiconductors are here to stay, but the big questions are: which will be the most important and which will reach the stage of developmental maturity first?

In the past few years, rapid progress has been made in both the fundamental understanding of the characteristics of germanium and silicon and in the practical utilization of their properties. With this progress

has come the realization that in many cases better devices could be made if these properties were a little different. For example, the temperature limitation on germanium transistors makes a higher energy band gap material like silicon desirable, i.e., a material in which the electronic bonds between atoms are stronger and it takes more energy (higher temperatures) to break them and free a sufficient number of electrons and positive holes to interfere with the transistor action. But, on the other hand, the higher carrier mobilities in germanium are attractive. A quick glance at the table on page 11 indicates that certain of the best characteristics of both germanium and silicon are obtainable in the compounds InP and GaAs, or that if you want a really high-temperature rectifier or transistor, AlSb is a likely candidate for the job.

Thus, III-V compound semiconductors (made from elements in the third and fifth groups in the periodic table) varying from the low energy band gap and high electron mobility InSb to the large band gap AlSb, provide diode and transistor materials which cover the range from —300 F to 950 F. Each has a place in the future.

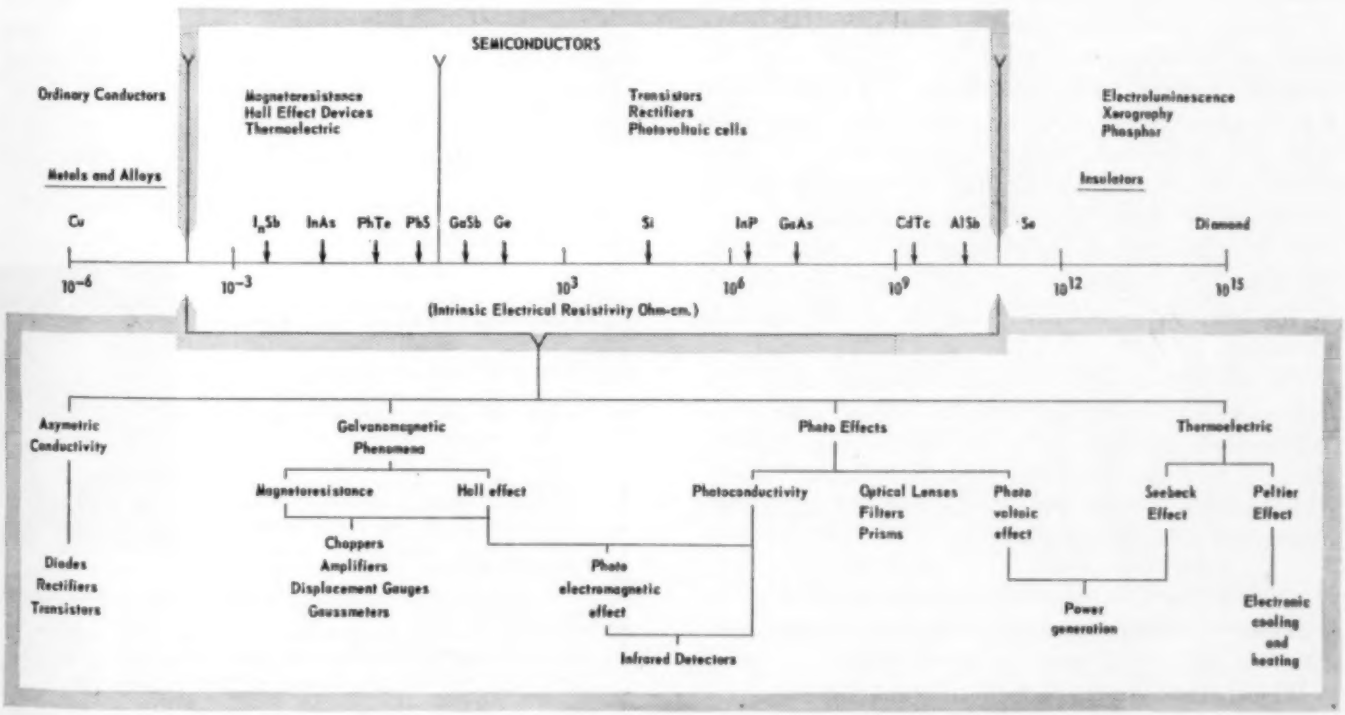
The materials listed in the table are representative of several groups of semiconducting compounds. Areas of their most likely application are also listed.

Of course, there are many more binary compounds which are semiconductors; also, there are ternaries such as the chalcopyrites, of which silver indium telluride ($AgInTe_2$) is an example. If this is not enough, there are alloys of these compounds such as gallium antimonide (GaSb) and AlSb, InP, and InAs, or the organic semiconductors like the phthalocyanines.

It will take many years merely to determine the basic characteristics of a small fraction of the possible combinations of elements which form semiconductors. Associated with this are the difficult problems involved in preparing these materials in the proper form and of the correct purity. In view of this almost insurmountable mountain of development work it is natural to ask the question, "when, if ever, will the use of compound semiconductors become practical?" The answer, of course, differs with each application and each material considered. While it may be another ten or twenty years before the ternary or organic compounds reach the stage of development where they will be of commercial importance, this year, 1957, promises to mark the beginning of commercial use of InSb for devices. Each successive year should see an ever-increasing number of electronic components utilizing compound semiconductors reaching the commercial markets.

Now let us look at a few of the more promising materials, and some new applications.

The photovoltaic effect which converts light into



The chart above shows the range of electrical resistivities commonly exhibited by semiconductors. The box at the bottom shows a breakdown of the properties and potential applications of semiconductors.

electrical energy has been used in light meters for photography for many years. The efficiency of the conversion of light to electrical power was not too important. Now, however, cells using p-n junctions in silicon have been made which have efficiencies of over 10 per cent. In this "solar battery" field, silicon can soon expect serious competition from cadmium telluride (CdTe), InP, GaAs, and AlSb. Gallium arsenide cells with solar radiation conversion efficiencies of over six per cent have already been made. The efficiency or output power per unit of surface area of the individual cells is a factor which should favor the compounds, but changes in the incident energy spectrum due to changing atmospheric conditions or even the time of day, the incomplete data on the electrical properties of these compounds, make it difficult to predict which will be the best. Since the differences in efficiency are expected to be small, it appears the most important factor will be the economics of production. A similar statement should also be true for power rectifiers.

In the field of infrared optics, intermetallic semiconductors are becoming especially important. Each semiconductor has a fundamental absorption region which depends on the energy band separation, i.e., photons with an energy greater than that of the energy band separation will be absorbed and excite free carriers. If their energy is less, some of it will be absorbed by the free carriers supplied by impurities and the amount absorbed, of course, will depend on the number of free carriers. Thus, a semiconductor with very few free carriers will be transparent to light of a longer wavelength than that corresponding to the fundamental absorption edge and can be used for infrared windows, lenses, and prisms. For photons with wavelengths shorter than the fundamental absorption edge, the absorption creates free carriers, or photoconductivity, which can be used to measure the intensity of the light. Since the photoconductive sensitivity is dependent on the ratio of the electron to hole mobility, InSb makes an extremely sensitive detector in the one to eight-micron region of the infrared spectrum.

The absorption edge in semiconductors can also be used as a basis for optical filters. In indium antimonide and indium arsenide, the absorption edge can be changed by controlling the impurity content (carrier concentration). This change should be useful for special types of optical filters.

Semiconductors for Galvanomagnetic Devices

When a conductor carrying an electric current is placed in a magnetic field which is at right angles to the direction of the current, the electrons which compose the electric current are forced toward one side of the conductor. As a result of this force, there is a piling up of electron on the side of the conductor until the voltage created by the difference in electron density builds up to such a value that the electric field exerts a force equal and opposite to that of the magnetic field. This voltage is called the Hall voltage after E. H. Hall who discovered it in 1879. By equating the forces caused by the magnetic field and those of the Hall electric field, we can obtain an expression which gives the number of electrons which are conducting the electric current. This technique has been used in studying semiconductors to determine the purity of the materials since the number of conduction electrons is related to the number of impurities.

By using special geometrical arrangements to short out the Hall voltage, the effective resistance of the conductor can be increased.

The ratio of the Hall voltage to the voltage along the conductor per unit length and unit of magnetic field gives the velocity of the electrons per unit electric field, i.e., the mobility of the electrons. Thus, the electron mobility can be determined and it is easily seen that it becomes a figure of merit for a Hall effect or magnetoresistance material.

Changes of up to 90:1 in resistance have been induced by magnetic fields of 30,000 gauss. A large number of applications of the Hall effect and magneto-resistance are made possible by the use of high-mobility compound semiconductors like InSb and InAs in which the mobility of the electrons is very high.

Since the Hall voltage is proportional to the electric current and magnetic field, it can be used in analog computing elements or to measure magnetic fields. Magnetic flux meters of this type are already commercially available. Clip-on d.c./a.c. ammeters have

Robert K. Willardson's chief interests, as reflected in more than a dozen published articles, center on the study of the properties of semiconductor materials and the development of new materials for use in components. His studies at Battelle contributed to the development of aluminum antimonide and indium antimonide as semiconducting materials. He has also participated in basic studies of transport phenomena in semiconductors, the relation of electrical conductivity to oxidation, corrosion, mechanical, and other properties of materials, and the relation of electron mobilities to crystal perfection and impurity content. Still another interest of his is the effects of nuclear radiation on semiconductors.

SOME SEMICONDUCTORS AND THEIR APPLICATIONS

		Band Separation ev. (T = 300° K)	Mobility (T = 300° K) cm²/volt-sec electrons	Mobility (T = 300° K) cm²/volt-sec holes	Melting Point, °C	Application
GaSb		0.6>	—	—	702	Rectifier, Transistors
Ge		0.72	3600	1900	936	Rectifier, Transistors
Si		1.1	~ 2000	~ 500	1420	High Temperature Rectifier, Transistors
InP		1.27	> 4000	650	~ 1100	High Temperature Rectifier, Transistors
GaAs		1.34	> 5000	300	~ 1200	High Temperature Rectifier, Transistors, Solar Batteries
CdTe		1.45	—	—	1045	High Temperature Rectifier, Transistors, Solar Batteries, Infrared Optics
AlSb		1.6	> 400	400	1050	High Temperature Rectifier, Transistors, Solar Batteries, Infrared Optics
Gold doped Ge	s	0.72	3600	1900	936	Infrared Detectors, Filter
HgTe	s	0.08	> 10,000	—	~ 700	Infrared Detectors, Filter; Magnetoresistance
InSb		0.16	75,000	800	523	Infrared Detectors, Filter; Magnetoresistance, Hall Effect
InAs		0.33	40,000	> 600	942	Infrared Detectors, Filter; Magnetoresistance, Hall Effect, Thermistors
PbTe		0.3	2000	1100	920	Infrared Detectors
PbSe		0.26	1200	600	1080	Infrared Detectors
PbS		0.4	800	400	1120	Infrared Detectors
Bi_2Te_3	s	0.16	>570	>400	580	Thermoelectric
ZnSb		—	—	—	563	Thermoelectric
CdSb		0.5	—	> 400	456	Thermoelectric
$Ag_2(Se, S)$	s	—	—	—	~ 860	Thermoelectric
CuAgTe	s	—	—	—	~ 925	Thermoelectric

> Minimum value ~ Approximately

also been constructed. Automatic electronic compasses using this principle have been used to control ships. Magnetoresistance displacement gages using InSb that measure mechanical movements as small as 1,000 angstroms have been constructed. Although the idea of practical galvanomagnetic components is new, their importance is already being realized in many development programs.

Perhaps the best practical applications for the Hall effect or magnetoresistance are contactless variable resistors, conversion of low lever d.c. voltages to a.c., and amplifiers requiring a very low noise level.

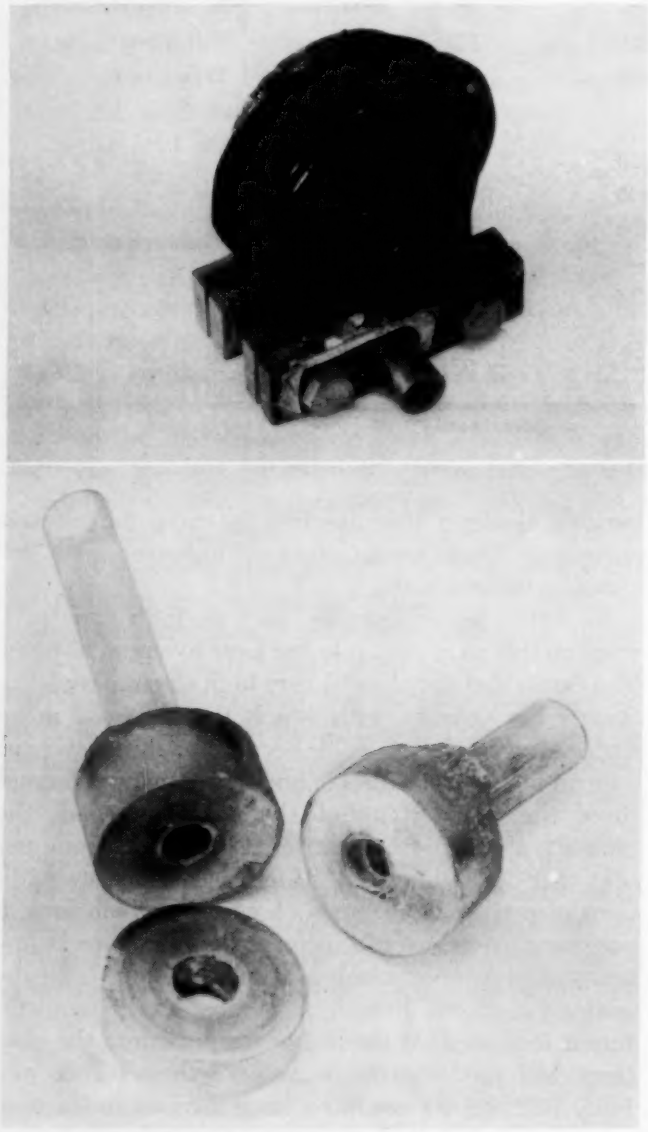
New Resistors

The large negative temperature coefficient of resistance in semiconductors has been used for a number of years. This type of element is called a thermistor and is commonly made from various mixtures of the oxides of manganese, nickel, cobalt, copper, uranium, iron, zinc, titanium, and magnesium. Its operation is based on the fact that the number of electrons (or positive carriers) that are free to carry the electric current in most semiconductors increases with increasing temperature.

New thermistor materials, such as InSb and InAs, work on this same principle but have two new features. The first is that they have a very high electron mobility that is the velocity with which the electrons move under a given electric field. Because of this they have a much higher electrical conductivity—many thousand times the conductivity of the oxides. Second, the mobility of the positive carriers is only about one per cent that of the electrons. Thus, by appropriate additions of p-type impurities such as zinc, which furnish positive carriers, we can increase the resistance at low temperatures by as much as a hundred and have the intrinsic electrons increase in number as the temperature is increased. At the higher temperatures, the electrons will predominate because of their higher mobility, and the net result is a large increase in the temperature coefficient of resistance. Using this technique InSb thermistors with a temperature coefficient of resistance about two per cent per degree Fahrenheit can be made (see figure on page 13). When p-type indium

arsenide with the proper impurity content is made, it is expected to have a temperature coefficient of resistance of three per cent per degree Fahrenheit.

Other materials have large positive temperature coefficients. Some of these are called semimetals because the number of free electrons which carry the electric current is nearly constant below the temperatures at which intrinsic (electronic bond breaking between atoms) conduction become important. The positive temperature coefficient is caused by a decrease in the mobility of the current-carrying electrons with an increase in temperature. This increase in electrical resistivity (decrease in electron mobility) is nearly proportional to the cube of the absolute temperature. Thus, between zero and 800 F (700 K) the increase in resistivity will be more than 3,000 per cent. The figure (right) on page 13 shows a resistivity increase of this type for lead selenide (PbSe).



The experimental cooling unit shown at the top, which was developed at Battelle, utilizes bismuth telluride. Temperature differences of 85 F have been obtained with the 2¼-inch-diameter unit. Below are arc-cast ingots of bismuth telluride of the type used in the unit's construction.

Another principle now being suggested for special resistors which have very large temperature coefficients of resistance over a relatively small temperature range is that of phase changes in semiconductors. Ideally, the material would be an insulator in one phase and a conductor in another phase. The change should take place instantaneously and reversibly at a given temperature. One of the first semiconductors studied (i.e. silver sulphide by Michael Faraday in 1834) has this type of characteristic. The resistivity of silver sulphide (Ag_2S) at room temperature is about 10^6 ohm-centimeters, but at 360 F the resistivity has dropped to about 0.02 ohm-cm. Much of this resistivity change occurs between 350 and 360 F because of a phase change. One disadvantage of Ag_2S is that part of the low-temperature conductivity is ionic. Hence, if it is used for direct currents, ionic transport will modify its electrical properties. However, the addition of impurities can reduce the ionic conductivity and can even smooth out the phase change. For example, as is shown in the figure (left) on page 13, an addition of 10 per cent calcium sulphide (CaS) to Ag_2S makes the change in resistivity from 10^5 ohm-centimeters at 45 F to 0.02 ohm-cm at 360 F nearly exponential with temperature and eliminates the sharp change between 350 and 360 F.

Recently, it has been found that solid solutions of barium-strontium titanate, to which small amounts of certain impurities have been added, produce oxide thermistor systems, which exhibit positive temperature coefficients of resistance as large as eight per cent per degree Fahrenheit. This large positive temperature coefficient of resistivity is caused by the cubic-tetragonal phase transition in barium titanate, which is modified by alloying with strontium titanate and the addition of lanthanum to provide a valency controlled n-type semiconductor. Resistivity increases from 500 ohm-centimeters at 160 F to a 10^6 ohm-centimeter at 300 F have been measured.

In the future, we can expect these unusual phase-change-induced resistance changes to form the basis for automatic low-frequency contactless switches, self-resetting circuit breakers, and many types of simple electronic temperature control or indicating equipment. The carrier mobility changes will be utilized in circuits requiring low-resistance elements.

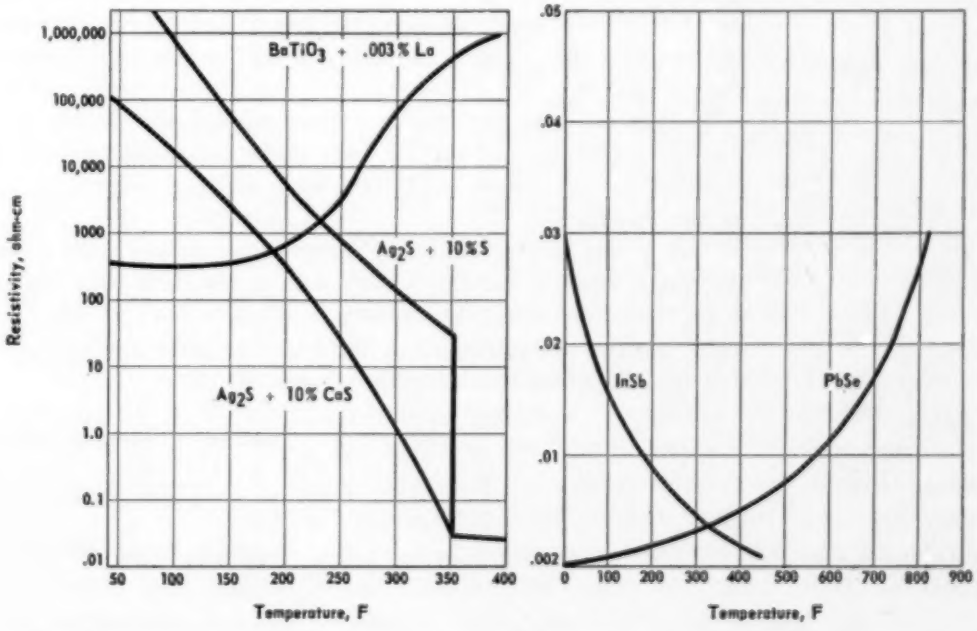
Efficient Thermoelectric Materials

For efficient generation of electric power, the hot junction must operate above 600 C. Thus, the melting point must be higher than this and intrinsic conduction must be negligible at this temperature, i.e., the energy band separation must be greater than 0.25 ev. Then, in order of importance, we have (1) a low lattice thermal conductivity, K_L, (2) a high thermoelectric power, Q, and (3) a low electrical resistivity p. The figure of merit of a thermoelectric material is Q^2T/Kp, where T is the junction temperature and K is the sum of the lattice K_L and the electronic K_e contributions to the thermal conductivity. The maximum temperature drop using a single thermoelectric stage is $Q^2T_c^2/8Kp$, where Tc is the temperature of the cold junction in degrees Kelvin.

Thermoelectric Materials

In 1821, Thomas Johann Seebeck, a German physicist, discovered that an emf is produced when a junction of two dissimilar metals is heated. For over a century we have used dissimilar metal alloys such as Chromel and Alumel in thermocouples to measure temperature. However, this effect in metals is not practical for generation of electrical power because of the low efficiency — less than one per cent. With the use of intermetallic semiconductors, experimental units have been developed which have an efficiency of seven per cent. A three-watt unit heated by a kerosene lamp and used to power small radios is in production in Russia. Larger units are being tested. Although such efficiencies are low compared with the 20 to 25 per cent obtained in a larger power sation, they are comparable to those obtained in small gasoline engine-generator units. Jean Charles Peltier, a French physicist, discovered in 1834 that there is a heating or cooling effect when an electric current flows through a junction of dissimilar metals. But the effect was very small, less than one degree Fahrenheit for most metals or alloys. In 1950, White, using bismuth alloys, obtained a temperature drop of 18 F. About this same time, a number of investigators in the U. S., England, Germany, and Russia began using intermetallic semiconductors such as zinc antimonide (ZnSb), cadmium-antimonide (CdSb), and bismuth telluride as one element and metal alloys as the other. Soon, temperature drops of 40 to 50 F were reported. A short time later both p and n-type Bi_2Te_3 and PbTe were used and temperature drops of 70 to 90 F were observed. Now, small cooling units were definitely practical and consideration was given to basic design problems. A unit using an annular construction which was made at Battelle is shown on page 12. This unit operated with a temperature difference of 85 F between the inner chamber and the outside fins with a power input of 20 watts. The temperature difference was 60 F for an input of four watts.

In the utilization of the Peltier effect, the Russians appear to be far ahead, at least if the published literature is any indication of the situation. They have developed a new type of hygrometer to measure the humidity of the air—probably the first practical use of thermoelectric cooling. Early last year, a commercial refrigerator was constructed using the basic design of the "Leningrad" domestic refrigerator which has a



Resistivity as a function of temperature for materials having unusually large temperature coefficients of resistance. The resistivity variations shown on the right involve phase changes; those on the left involve carrier-mobility changes.

capacity of a little over four cubic feet. The electric power consumption during startup is 75 watts and, under steady operation, 55 watts. In experiments using several stages, temperature drops from room temperature (75 F) to —108 F have been obtained.

What improvements can be expected in thermoelectric materials in the future? Materials have been improved so that single-stage temperature drops as large as 140 F have been recently reported. Alloying of compounds such as lead selenide and tin telluride has shown that the lattice contribution of the thermal conductivity can be further reduced.

If the thermal conductivity of Bi_2Te_3 could be halved by suitable alloying without changing the optimum thermoelectric power or resistivity, the figure of merit (see cut) of the material would be doubled and thermoelectric refrigeration and air conditioning would be competitive with existing systems.

If a new material were discovered with a thermal conductivity and electrical resistivity like Bi_2Te_3, but with twice the thermoelectric power, the figure of merit would increase by 300 per cent and mechanical refrigeration would become as obsolete as the horse and buggy. Thus, the alloying of the new materials now being studied or the discovery of other newer and better ones promise to make thermoelectric cooling, heating, and generation of power competitive with the electromechanical systems now in use.

As this article suggests, the field of application of compound semiconductors is a broad one. Though the work may still be considered as in its infancy, research and development expenditures are already in the millions of dollars. The results of the exploratory stages of this research are just now being analyzed. More years of investigation and the expenditure of additional millions of dollars will be required before the field reaches maturity. Yet it is safe to predict that compound semiconductors will be in regular use in our planes, automobiles, and homes by 1965.

GALILEO vs. ARISTOTLE

Salviati . . . I greatly doubt that Aristotle ever tested by experiment where it be true that two stones, one weighing ten times as much as the other, if allowed to fall at the same instant from a height of, say, 100 cubits, would so differ in speed that when the heavier had reached the ground, the other would not have fallen more than 10 cubits . . .

"If then we take two bodies whose natural speeds are different, it is clear that on uniting the two, the more rapid one will be partly retarded by the slower, and the slower will be somewhat hastened by the swifter . . .

"But if this is true, and if a larger stone moves with a speed of, say, eight while a smaller moves with a speed of four, then when they are united, the system will move with a speed less than eight; but the two stones when tied together make a stone larger than that which before moved with a speed of eight . . .

Galileo in *Dialogues Concerning Two Sciences*

NOTES from BATTELLE

SEMICONDUCTOR ABSTRACTS

The tremendous expansion of literature in the field of semiconductor and luminescent materials is evident from the contents of the third annual volume of *Semiconductor Abstracts*, the 1955 issue. This publication, sponsored by the Electrochemical Society, has shown a growth in the number of abstracts from 765 to 1258 in a single year.

The most outstanding developments to be noted in the recently issued volume of the *Abstracts* are in the areas of purification of silicon and the development of material processing techniques to give practical silicon devices. Also worthy of mention is the increasing activity on intermetallic compounds as supplements or substitute materials for germanium and silicon.

In the 1955 issue, the compilers have included statements of the important results reported in the original articles, thus reducing the necessity for securing the articles themselves.

The preparation of the publication was directed by the Management and Editorial Committee of the Electrochemical Society's Electronics Division, under the chairmanship of Ernest Paskell, Jr. of Battelle. The abstracts themselves were prepared by members of Battelle's solid state devices and physical chemistry divisions.

The compilation is published by, and available from, John Wiley & Sons, Inc., New York, and Chapman & Hall, Ltd., London.

IRON DESULFURIZATION

Because of the long-time trend toward higher sulfur contents both in coke and in iron ore, an economic method for the removal of sulfur from iron is a matter of considerable technical importance to foundries and steel mills. Some desulfurization is already being practiced to maintain quality in certain types of iron and steel production.

Research on the problem for Diamond Alkali Company, a major producer of basic industrial chemicals, has resulted in the development of a new, continuous, sulfur-removal process by Battelle.

In the new process, molten iron and caustic soda are fed continuously into an apparatus where desulfurization occurs as the materials are intermixed. Desulfurized metal and caustic slag flow continuously from the apparatus into molds or ladles.

Introduction of a jet of oxygen into the mixing chamber makes it possible to remove substantial amounts of silicon at the same time the sulfur content is being reduced.

Under laboratory conditions, the new process has been used to achieve 90 per cent reductions in sulfur content, according to Battelle technologists N. H. Keyser and H. W. Lownie. Because of the low final sulfur content, the process holds promise for use in the production of ductile cast iron as well as in the desulfurization of pig iron prior to conversion into steel.

Desulfurization occurs rapidly because thin layers of reacting materials are used. Samples taken during heats at Battelle's pilot-plant laboratory show that the sulfur-removal reactions after addition of the caustic soda require less than a minute for completion. Thus, large quantities of iron can be treated in a unit requiring relatively small space.

BeO SINTERABILITY

The capacity of a beryllium oxide powder to form the dense, sintered structures needed for nuclear reactors is closely related to the nature of its impurities and to the temperature used in its calcination. This conclusion, drawn from research conducted for the Atomic Energy Commission, was reported at Dallas to the American Ceramic Society by Battelle technologists, J. F. Quirk, N. B. Mosley, and W. H. Duckworth.

Beryllium oxide powders prepared by calcining beryllium hydroxide were studied in an effort to relate wide differences in sinterability with other more basic properties of the oxide powder. Properties investigated included lattice parameters, thermal dehydration, surface areas, and refractive indices. Although unexpected variation in these properties was observed, no simple relation with sinterability was found.

Impurities and calcining temperature, however, appeared to exert a critical effect on sintering behavior.

Calcining temperatures above about 2200 F produced dead-burned powders that would not sinter into high-density structures. The Battelle researchers also found that very pure ammonia-precipitated powder sintered poorly, regardless of calcination treatment.

On the other hand, a preparation of pure beryllium hydroxide, deliberately contaminated with small amounts of soluble sulfate salts, sintered to a much higher density than did pure beryllium hydroxide. From these results it was concluded that the impurity ions, when introduced by the superficial method of leaching, caused a marked improvement in sinterability of the purified powder. Although promotion of sinterability by introduction of diffusible impurities is not new, these experiments demonstrated the effectiveness of such minor additives.

* FLY ASH IN CLAY PRODUCTS

Fly ash, the fine inorganic impurities recovered from the combustion of coal or lignite, deserves consideration as an additive in some structural clay products, according to Donald J. Bowers and M. Jack Snyder of Battelle. A large-volume by-product, fly-ash often creates a waste-disposal problem. Therefore, they point out, it would be an inexpensive material for manufacturers near supplies of fly ash. At the same time, variations in the characters of the various fly ashes require that each ash be considered individually for each use.

The technologists report that limited experimental work at Battelle for the Texas Power & Light Company and the Aluminum Company of America showed these results from the addition of a fly ash to certain fire clays and a shale:

The modified shale and clay bodies were extruded more easily.

With fly ash as 25 per cent of the mixture, the shale body was essentially as dense, was stronger, and had lower drying, but higher firing shrinkage than a body of shale alone.

A 50 per cent fly ash—50 per cent shale body, though more porous, may be satisfactory in brick or sewer pipe for use where some porosity can be tolerated.

With fly ash as 25 per cent of the mixture, one fire clay body was stronger and had less drying and firing shrinkage than a body of clay alone. A second clay, when modified, however, had low shrinkages but somewhat reduced strength, and appeared satisfactory only for some selected products.

* METAL GRANULATING

Direct disintegration of molten ferrosilicon to a fine powder has been achieved in a granulation method developed for the Rhude Media Company, Hibbing, Minnesota, by metallurgists at Battelle.

The process creates rounded or generally spherical particles of ferrosilicon. Granulation is accomplished by the force of a high-velocity jet of water and gas colliding with a stream of the molten metal.

The fineness of the particles and the distribution of particle sizes is, within limits, determined by several variables that can be controlled, says Battelle process metallurgist R. C. Williams. Among these variables are the relative sizes of the water-gas jet and the stream of molten metal. The roundness of the granules is determined partly by variables such as these and partly by the surface tension of the particular alloy, in this case, ferrosilicon. With ferrosilicon, as much as 50 per cent of the particles pass through a 65-mesh screen, and up to 70 per cent through a 40-mesh sieve.

As developed at Battelle for the production of heavy-media material used in ore beneficiation, the process achieves granulation through the force of collision of a high-velocity jet of water with a falling stream of molten metal. This high velocity is obtained by introducing the water under pressure into a special nozzle where additional momentum is imparted to it by the expansion of high-pressure gas mixed with the water in the nozzle.

The process is potentially useful, says Williams, in many situations where it is desirable to eliminate a grinding stage and proceed directly from molten metal to finely granulated spheroidal material on a high-tonnage basis, as for example, in the production of metal powders of controlled composition.

As a possibility, it has been suggested that the process might be adaptable to fritting molten ceramic oxides. By this method, it might be possible to break up the frit into particles smaller than those presently obtained and thus reduce subsequent milling.

* The finding of etchants that will satisfactorily show flow lines and macroscopic structure is a frequent problem for the metallographer. The search for a good etchant for SAE 403 steel forgings, recently led to the discovery at Battelle of an electrolytic composition consisting of 20 cc ethylene glycol, 20 cc HNO_3, and 100 cc ethyl alcohol (absolute) which also gives excellent results for revealing the microstructure of a number of metals and alloys. Development and application of the etchant were carried through by Clarence Barnhart, Albert Friday, and Harold Hucek.

Writings by STAFF Members

Combustion and Flame, v. 1, June 1957, contains the following articles by staff members:

Influence of Diborane on Blow-off Limits of Hydrocarbon Flames. P. F. Kurz, pp. 212-216.

The ratio of hydrocarbon in these binary mixtures at a given jet velocity, v_1, at blow-off to the hydrocarbon in a hydrocarbon flame at blow-off also at v_1 decreases as v_1 increases. In flames of binary hydrocarbon mixtures, the ratio increases as v_1 increases. This unique behavior is believed to result because diborane burns selectively.

Some Factors Influencing Stability Limits of Bunsen Flames. P. F. Kurz, pp. 162-178.

The blow-off limit of any given fuel-air mixture is independent of burner diameter when expressed as critical velocity gradient. Helium narrows both lean and rich blow-off limits, but neither He nor N affect flash-back limits. Nitrogen and air widen the lean blow-off limit increasingly as the annular-jet velocity is increased.

Oak Ridge National Laboratory (U. S. Atomic Energy Commission) TID-7530, April, 1957, contains the following articles by staff members:

Thermal Fracture of Noncircular Ceramic Cylinders. E. M. Baroody, pp. 161-163.

Theoretical and experimental work indicate that the nonaxial heat flow per unit length, W_{max}, required to fracture a hollow ceramic cylinder could be represented by the product of two separate factors, M and S, characterizing the material and the shape, respectively. The relationship $W_{max}=MS$ is shown to be valid for cylinders having circular, square, or triangular outer peripheries.

Properties of Some Refractory Fuel Compounds. M. J. Snyder, G. B. Engle, and L. D. Loch, pp. 141-143.

Available data on the physical properties of 20 refractory compounds of uranium with C, N, S, Si, B, Ni, Al, or Fe are tabulated.

Characterization of Sinterable Oxide Powders. John F. Quirk, pp. 55-65.

Beryllia powders made from four different lots of Be $(OH)_2$ showed a wide range of sinterability. The temperatures required for sintering the powder compacts to theoretical density ranged from 2300 to above 3200 F. Lattice parameters, dehydration, surface areas, and refractive indices were determined after calcination in air at 400, 800, 1000, and 1200 C. No simple relation with sinterability in hydrogen atmosphere was found.

Rubber Age contains the following articles by staff members: **Compounding Rubbers for Resistance to Silicate-Ester Fluids. I. Neoprene WRT.** L. E. Novy and R. A. Clark, May 1957, pp. 265-274.

This compounding study resulted in improved Neoprene WRT compounds for use in contact with silicate-ester type hydraulic fluids at high temperatures. The work showed that rubberlike properties can be maintained for at least 168 hours at 400° F. by judicious choice of fillers and curatives. The most successful compositions were either partially or totally reinforced with nonblack fillers, plasticized with butyl oleate, and cured with a combination of magnesia, zinc oxide, and NA-22.

Compounding Rubbers for Resistance to Silicate-Ester Fluids. II. Nitrile, Vinyl Pyridine, Butyl and Acrylate Polymers. W. J. Mueller and R. A. Clark, June 1957, pp. 447-459.

In attempts to develop a composition which would resist degradation when aged for periods up to 500 hr. at 400 F in silicate-ester hydraulic fluids, best results were obtained with BA-12 stocks. Tensile strength was low, but stocks did not harden or crack due to aging. Philblack A or Hi-Sil were the best fillers, and the best compositions were vulcanized with a mixture of sulfur, tetramethythiuram disulfide and triethylenetetramine.

Recommended Practice for Repair Welding and Fabrication Welding of Steel Castings. 58 pp 1957. Steel Founders' Society of America, Cleveland.

Contains the results of a research project conducted by Battelle to provide a single handy reference manual. Includes concise, but comprehensive data on electrodes, preparation for welding, selding methods, and effects of welding on carbon and low-alloy steel castings.

A Hot-Hardness Survey of the Zirconium-Uranium System. W. Chubb, G. T. Muehlenkamp, and A. D. Schwope. *American Society for Metals, Transactions*, v. 50, *Preprint No.* 2, 1957, 10 pp.

A complete hardness survey of the zirconium-uranium system was made at temperatures from room temperature to 900 C. At 700 C, an unusually hard phase was indicated in the alloys containing 95 to 100 at. per cent uranium.

The Surface Metallurgy of Protective Coatings. Charles L. Faust. *Metal Progress*, v. 71, May 1957, pp. 101-106.

Protective alloy coatings for high-temperature service are made by plating alternate layers of the metals and then alloying by a diffusion heat treatment. Results are often affected by the surface conditions of the basis metal. Rapid diffusion alloying of basis metal and coating and diffusion through the coating may sometimes be stopped by an intermediate barrier layer or thin plate of a third, slowly diffusing metal.

Metallic Coatings. Charles L. Faust and William H. Safranek. Paper from "Proceedings of Symposium on Preservation for Mobilization Requirements". U. S. Naval Civil Engineering Research and Evaluation Laboratory. 1956. pp. 278-314.

A number of metallic coatings are evaluated with reference to their use in long-term storage of military equipment for immediate mobilization. Data on properties, method of application, specifications, coating thickness, and estimated life are included.

Ammonium Carbonate Pressure Leaching of Uranium Ores. B. G. Langston, R. D. Macdonald, and F. M. Stephens, Jr. *Journal of Metals*, v. 9, June 1957, pp. 752-756.

Studies of temperature, pressure, strength of solution, and the amount of oxidation required to convert the quadrivalent uranium to the hexavalent state, and of the operation of an integrated plant, demonstrated that the method is technically attractive for extraction of U from high-lime ores.

Members of the Battelle staff are authors of the recently published articles and books listed on this page. In most cases, reprints are available from the Battelle Publications Office, 505 King Avenue, Columbus 1, Ohio.

WORLD-WIDE ABSTRACTS

in the FIELDS *of*

501a Aeronautical Engineering
502a Agriculture
503a Biochemistry and Biophysics
506a Ceramics and Concrete
508a Chemical Engineering
510a Chemistry—Analytical
513a Chemistry—Inorganic and General
514a Chemistry—Organic
520a Chemistry—Physical
526a Coatings
527a Control Systems, Computers, and Systems Engineering
528a Electrical Engineering
529a Electrochemistry
530a Electronics
534a Engineering Economics
534a Fluid Mechanics
535a Food Technology
536a Fuels and Combustion
536a Geology, Geophysics, Mineralogy, and Mining Engineering
537a Graphic Arts
538a Heat Power
538a Information—Preparation and Dissemination
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540a Lubrication and Friction
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543a Metals—Corrosion
545a Metals—Extraction and Refining
546a Metals—Finishing, Polishing, and Cleaning
546a Metals—Foundry Practice
547a Metals—Heat Treatment
548a Metals—Mechanical and Physical Properties
551a Metals—Mechanical Working
552a Metals—Metallography, Transformations, and Structures
554a Metals—Powder
555a Nondestructive Testing and Quality Control
555a Nuclear Physics, Nucleonics, and Radiation
560a Operations Research and Management Engineering
561a Ore and Materials Beneficiation
562a Physics
565a Plastics
567a Pollution and Wastes
567a Rubber and Elastomers
568a Space Heating and Conditioning
569a Textiles, Fibers, Leather, and Paper
570a Welding and Joining
572a Miscellaneous

BATTELLE Technical Review ABSTRACTS

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***Asterisks mark items that may be used in the Battelle Library only. None of the unbound materials listed below are available for interlibrary loan.**

AERONAUTICAL ENGINEERING

10942 Design of Air Frames for Nuclear Power. Clarence L. Johnson and F. A. Cleveland. *Aeronautical Engineering Review*, v. 16, June 1957, p. 48-57.

10943 Flutter Model Testing at Transonic Speeds. W. P. Targoff and R. P. White, Jr. *Aeronautical Engineering Review*, v. 16, June 1957, p. 58-62.

Flutter research on reflection plane models of straight, swept, and delta wings in a 3 x 4 ft. transonic test facility.

10944 Application of Dynamic Programing to the Airplane Minimum Time-to-Climb Problem. T. E. Cartaino and S. E. Dreyfus. *Aeronautical Engineering Review*, v. 16, June 1957, p. 74-77.

Dynamic programing offers a method of solution for the climb problem which is fast, readily adaptable to routine engineering calculation, and allows the inclusion of the effects of variations in airplane weight and drag along the flight path.

10945* On the Measurement of Supersonic Aerofoil Drag by Pressure Traverse. R. E. Meyer. *Aeronautical Quarterly*, v. 8, May 1957, p. 123-144.

The drag in two-dimensional flow is expressed in terms of the distributions of static and stagnation pressures along a traverse line downstream of the airfoil

10946 Aircraft Materials and Processes. George F. Titterton. 5th Ed. 398 p. 1956. Pitman Publishing Corp., New York. (TL698 T53a5)

Emphasis is placed on the effects of heat from aerodynamic and jet engine heating on aircraft materials in order to help the engineer select the most efficient materials. Includes suggestions for working, heat treating, and finishing materials for specific applications.

10947* Anti-Gravity—Fact or Fantasy? Irwin Stambler. *Aviation Age*, v. 27, May 1957, p. 26 + 4 p.

An attempt to separate facts from fantasy concerning the possibility of anti-gravitational flight.

10948* Stability and Control Problems Associated With Supersonic Aircraft. O. E. Michaelsen. *Canadian Aeronautical Journal*, v. 3, May 1957, p. 146-151.

Analysis of longitudinal characteristics of supersonic aircraft. (To be continued.)

10949 A Method of Cascade Design for Two-Dimensional Incompressible Flow. S. Rosenblat and L. C. Woods. *Commonwealth of Australia, Dept. of Supply, Aeronautical Research Committee, Report* ACA-58, Mar. 1956, 30 p. (TL529 Au78.1r Vis.)

Velocity is prescribed directly as a function of perimeter distance. Method is essentially numerical; it allows for a finite trailing edge angle, and is quicker and more flexible than the analytic method.

10950* The Unsteady Motion of a Thin Aerofoil in an Incompressible Fluid. D. S. Jones. *Communications on Pure and Applied Mathematics*, v. 10, Feb. 1957, p. 1-21.

It is assumed that the airfoil may be approximated by a polynomial curve and that the boundary condition on the curve may be replaced by one on the chord. Formulas for pressure distribution, lift, downwash, and drag are obtained.

10951 Fourth Anglo-American Aeronautical Conference. Joan Bradbrooke and E. C. Pike, editors. 356 p. 1954. Royal Aeronautical Society, London. (TL505 In8)

Twelve papers dealing with aircraft structures and structural adhesives, pod mounting of jet engines, helicopter design, fatigue, de-icing, power plants for rotary wing aircraft, and aerodynamics of compressor blade vibration.

10952 Boost Phase Trajectory Analysis Techniques. C. D. West. *Jet Propulsion*, v. 27, May 1957, p. 527-533.

Four numerical approaches to the solution of the equations for a cruciform, uncontrolled missile booster.

10953 Vortex Interference Effects on the Aerodynamics of Slender Airplanes and Missiles. Alvin H. Sacks. *Journal of the Aeronautical Sciences*, v. 24, June 1957, p. 393 + 10 pages.

10954 Aircraft Materials—Present and Future. *Materials & Methods*, v. 45, May 1957, p. 126-130.

Considers problems associated with airframe and power plant materials.

10955 High Speed Flight. J. Black. *Research*, v. 10, May 1957, p. 177-184.

Brief comments on the speed of sound, aerofoil at high speed, thermal barrier, and propulsion.

10956 Some Aspects of Three-Dimensional Cavity Flow. A. J. Taylor-Russell. *Royal Aeronautical Society, Journal*, v. 61, May 1957, p. 345-352.

An investigation of the forces on, and the flow behind, an equilateral triangular plate, with sharp edges. Includes wind tunnel measurements of force coefficients, static pressure, and mean velocity, and observations of wake flow in smoke and water tunnels.

10957* Tilt-Wing VTOL Aircraft. *Shell Aviation News*, no. 224, Feb. 1957, p. 5-7.

Performance possibilities. Short haul comparison with helicopter operation.

10958* Robot Control of Aircraft. F. H. George. *Shell Aviation News*, no. 224, Feb. 1957, p. 8-11.

An indication of the direction research is taking towards the design of an aircraft control system which will be fully automatic and entirely independent of human monitoring.

10959 Third Anglo-American Aeronautical Conference. Joan Bradbrooke and E. C. Pike, editors. 638 p. 1952. Royal Aeronautical Society, London. (TL505 In83d)

Twenty papers on various aspects of aircraft design, construction, and operation.

10960 A Theoretical Study of the Effect of Upstream Transpiration Cooling on the Heat-Transfer and Skin-Friction Characteristics of a Compressible, Laminar Boundary Layer. Morris W. Rubesin and Mamoru Inouye. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3969, May 1957, 41 p. (TL570 Un3t)

Analysis is restricted to a Prandtl number of unity and linear variation of viscosity with temperature.

10961 Ground Simulator Studies of the Effect of Valve Friction, Stick Friction, Flexibility, and Backlash on Power Control System Quality. B. Porter Brown. *U. S. National Advisory Committee for Aeronautics, Technical Note* 3998, Apr. 1957, 45 p. (TL570 Un3t)

10962 Wing Theory. A. Robinson and J. A. Laurmann. 569 p. 1956. Cambridge University Press, London. (TL574.A4 R56w)

Includes the "classical" theory of airfoils at low speeds in two and three dimensions as well as some of the latest developments in supersonic flow. Hydrodynamic foundations of the subject are developed from first principles.

See also: **10975** (aircraft application of agricultural chemicals); **11567** (telemetering for the earth satellite); **11630** (radio navigation equipment); **11701** (uses of artificial satellite); **11795** (stress analysis); **11820** (properties of aircraft metals); **11828** (metals for high-speed flight); **11829** (heat-resisting alloys for aircraft).

AGRICULTURE

10963* Simazin and Related Triazines as Herbicides. Clayton Bartley. *Agricultural Chemicals*, v. 12, May 1957, p. 34 + 5 pages.

Simazin, or 2-chloro-4,6-bis-(ethylamino)-s-triazine, appears outstanding as a pre-emergence application for weed control in corn, it also may be used for tomatoes, potatoes, asparagus, and grapes.

10964* Antibiotics in the Control of Plant Disease. S. H. Crowdy. *Agricultural Review*, v. 11, May 1957, p. 18-22.

Streptomycin, chloramphenicol, and griseofulvin were used as systemic agents.

10965 Effects of Auxins on Development of Apricot Seeds and Seedlings. Muriel V. Bradley and Julian C. Crane. *American Journal of Botany*, v. 44, Feb. 1957, p. 164-175.

Auxin treatment of parent trees may produce delayed morphogenic and/or physiological effects in the seeds without causing any morphological aberrancies shortly after auxin application.

10966 On the Behavior of Radioactive Fission Products in Soil. Their Absorption by Plants and Their Accumulation in Crops. V. M. Klechkovsky, editor. (Translated from the Russian. 227 p. 1957. Atomic Energy Commission, Washington, D. C. (QC790 Ak130)

10967* Protein Synthesis in Ripening Pea Seeds. I. Analysis of Whole Seeds. II. Development of Embryos and Seed Coats. III. Study of the Pods. Ilse Dorothea Raacke. *Biochemical Journal*, v. 66, May 1957, p. 101-116.

10968 Studies on Rubus Virus Diseases in British Columbia. IV. Transmission of Raspberry Mosaic Viruses to *Fragaria Vesca L.* Richard Stace-Smith and Frances C. Mellor. *Canadian Journal of Botany*, v. 35, May 1957, p. 287-290 + 1 plate.

Rubus yellow-net virus, but not black raspberry necrosis, was passed to *F. vesca* by leaf-grafting.

10969 Uptake and Translocation of C^{14}-Labelled Sugars Applied to Primary Leaves of Soybean Seedlings. C. D. Nelson and Paul R. Gorham. *Canadian Journal of Botany*, v. 35, May 1957, p. 339-347.

A method involving the use of a detergent and B was developed for the introduction of C^{14}-labelled sugars into leaves. Translocations of these sugars is compared with that of C^{14} from C fixed in photosynthesis.

10970* Characteristics of Spray Deposits Resulting From Aircraft Application of Oil-Carrier Sprays. J. J. Sexsmith, W. W. Hopewell, D. T. Anderson, G. C. Russell, and H. Hurtig. *Canadian Journal of Plant Science*, v. 37, Apr. 1957, p. 85-96.

A greater percentage of spray was recovered at ground level, and more variation in volume deposit and droplet size occurred across the effective spray swath in the upwind flight than in the crosswind flight application.

10971* Primary Place of Action and Symptoms Induced in Plants by 3,(4-Chlorophenyl)-1,1-Dimethylurea. Wm. Harold Minshall. *Canadian Journal of Plant Science*, v. 37, Apr. 1957, p. 157-166.

Applications of "monuron", a new herbicide, to kidney-bean, tomato, spinach, corn, and barley.

10972 Plant Virus Diseases and Their Identification. R. Markham. *Endeavour*, v. 16, Apr. 1957, p. 99-106.

Includes color illustrations.

10973* Farm Chemicals Handbook. 367 p. 1957. Ware Bros. Co., Philadelphia. (TP963 F22 Ref.)

Includes dictionary of terms, state law summaries, directory of manufacturers, and buyers' guide.

10974 Forest Practices. Developments in the United States 1940-1955. 39 p. 1956. Society of American Foresters, Washington, D. C. (SD565 So13f)

Major developments of the period; present state of legislation on cutting practices; annotated bibliography of pertinent written material.

10975 Handbook on Aerial Application in Agriculture. 146 p. 1956. Texas A. & M. College System, College Station, Texas. (TL722.1 H19)

Aircraft and air distribution equipment. Control of insects and weeds. Use of preharvest chemicals. Fertilizing, disease control, and seeding.

10976* (English.) **Translocation of Herbicides. I. The Mechanism of Translocation: Methods of Study With C^{14}-Labeled 2,4-D. II. Absorption and Translocation of 2,4-D by Wild Morning-Glory.** Alden S. Crafts. **III. Uptake and Distribution of Radioactive 2,4-D by Brush Species.** Oliver A. Leonard and Alden S. Crafts. *Hilgardia*, v. 26, Dec. 1956, p. 287-415.

10977* Earliness in F_1 Hybrid Huskmelons and Their Parent Varieties. Guy Weston Bohn and Glen N. Davis. *Hilgardia*, v. 26, Mar. 1957, p. 453-471.

Date of planting was the most important factor affecting rate of development. Varieties exhibited marked differences so that the earliest variety in later plantings matured before the latest variety in plantings started 28 days earlier.

10978 Chemical Determination of Perthane Residues on Agricultural Crops. J. R. W. Miles. *Journal of Agricultural and Food Chemistry*, v. 5, May 1957, p. 349-350.

Method involves the extraction of Perthane residues with chloroform, dehydrochlorination, and reaction of the dehydrochlorination products with concentrated H_2SO_4 at room temperature. The characteristic peach color obtained has a strong absorption maximum at 493 mμ.

10979 Granulation of Mixed Fertilizers in Experimental Equipment and Determination of Storage and Drilling Characteristics of the Products. Herbert F. Rapp and John O.

Hardesty. *Journal of Agricultural and Food Chemistry*, v. 5, June 1957, p. 426-433.

Small-scale granulation equipment provides an economical way of determining optimum processing conditions in a short time with small amounts of test materials.

10980* The Relative Toxicity, Synergistic Activity, and Knockdown Effectiveness of Mixtures of Piperonyl Butoxide With Allethrin and Its *Trans* Fraction and Isomers as House Fly Sprays. W. A. Gersdorff, Norman Mitlin, and P. G. Piquett. *Journal of Economic Entomology*, v. 50, Apr. 1957, p. 150-156.

10981* Field and Laboratory Evaluations of Lead Arsenate, Wettable Sulfur and Hydrated Lime Against the Plum Curculio. E. H. Smith. *Journal of Economic Entomology*, v. 50, Apr. 1957, p. 177-183.

All field treatments resulted in marked reduction in injury, greater reduction occurring on cherry than on prune. Residues of each of the materials caused reduced feeding and oviposition in laboratory tests.

10982* Effects of Oil Spray and of Variation in Certain Spray Ingredients on Juice Quality of Citrus Fruits in California Orchards, 1950-1953. L. A. Riehl, R. T. Wedding, J. L. Rodriquez, and J. P. LaDue. *Journal of Economic Entomology*, v. 50, Apr. 1957, p. 197-204.

10983* The Systemic Behavior of *O,O*-Diethyl *S*-2-(Diethylamino)-ethyl Phosphorothiolate and Its Salts. R. L. Metcalf, E. M. Stafford, T. R. Fukuto, and R. B. March. *Journal of Economic Entomology*, v. 50, Apr. 1957, p. 205-210.

Behavior was evaluated in cotton and lemon plants by using P^{32} radiotracers.

10984* Effects of Site Treatment, Fertilization, and Brownspot Control on Planted Longleaf Pine. Harold J. Derr. *Journal of Forestry*, v. 55, May 1957, p. 364-367.

10985* A Method of Growing Apple Trees by Spraying Their Roots With Nutrient Solution. W. A. Roach, et al. *Journal of Horticultural Science*, v. 32, Apr. 1957, p. 85-98 + 2 plates.

10986 Surface Properties of Phosphate Materials by Isotopic Exchange. I. Rock Phosphate. J. Cano Ruiz and O. Talibudeen. *Journal of the Science of Food and Agriculture*, v. 8, May 1957, p. 305-308.

Radioactive phosphorus is used in the estimation of the surface phosphate of fertilizers and apatite rock. Surface areas of these materials calculated from these estimates are smaller than those derived from gas-adsorption methods.

10987 New Fungicides and Fungicide Combinations for Tomatoes. M. C. Strong. *Michigan State University, Agricultural Experiment Station, Quarterly Bulletin*, v. 39, May 1957, p. 563-569.

Combination spray treatments using ziram of zineb with fixed Cu, each at one-half the recommended concentration, continue to give good control of anthracnose, early blight, and Septoria blight. If late blight threatens, the fixed Cu portion of the spray should be increased to the usual recommendation (2 lbs. of metallic Cu to 100 gal.

10988 Gibberellin and Higher Plants. II. Induction of Flowering in Biennials. III. Induction of Flowering in Long-Day Annuals Grown Under Short Days. S. H. Wittwer and M. J. Bukovac. **IV. Flowering Responses of Some Flower Crops.** R. S. Lindstrom, S. H. Wittwer, and M. J. Bukovac. **V. Promotion of Growth in Grass at Low Temperatures.** S. H. Wittwer and M. J. Bukovac. *Michigan State University, Agricultural Experiment Station, Quarterly Bulletin*, v. 39, May 1957, p. 650-686.

10989* Evidence for "Gibberellin-Like" Substances From Flowering Plants. Bernard O. Phinney, Charles A. West, Mary Ritzel, and Peter M. Neely. *National Academy of Sciences of the United States of America, Proceedings*, v. 43, May 1957, p. 398-404.

Extracts which give a "gibberellin-like" response in bioassay tests were obtained from seven different families of plants.

10990* Virus Sprays for Control of *Pieris rapae* L. J. M. Kelsey. *New Zealand Journal of Science and Technology*, v. 38, sec. A, Apr. 1957, p. 644-646.

Shows that it is possible to spread artificially a caterpillar virus in aqueous sprays for control of the common white butterfly.

10991* The Ascorbic Acid Content at Different Stages of Growth of Stem Rust Susceptible and Resistant Wheats Grown Under Different Conditions. Arthur J. Pilgrim and Maurice C. Futrell. *Phytopathology*, v. 47, Apr. 1957, p. 193-196.

No consistent correlation was found between ascorbic acid concentration and resistance to stem rust.

10992* The Experimental Reproduction of Tomato Internal Browning by Inoculation With Strains of Tobacco Mosaic Virus. John S. Boyle and David C. Wharton. *Phytopathology*, v. 47, Apr. 1957, p. 199-207.

Internal browning as it occurs in Pennsylvania is interpreted to be a "shock" reaction, coming as a direct result of virus invasion of the fruit, followed by a hypersensitive response of the host.

10993* Effect of 6-(Substituted)Thio-and Amino-Purines on Germination of Lettuce Seed. Charles G. Skinner, J. Russell Claybrook, Freddie Talbert, and William Shive. *Plant Physiology*, v. 32, Mar. 1957, p. 117-120.

Several 6-substituted amino- and thio-purines were found to stimulate the rate of lettuce seed germination. The size of the substituent group on the amino-purines is less specific for this activity than is the size of the group on the thio-purine. Stimulation is most readily observed in the dark at 30 C.

10994 Climate and Agriculture. Frits W. Went. *Scientific American*, v. 196, June 1957, p. 82 + 11 pages.

The range of a cultivated plant can be determined by growing it in a "phototron", a laboratory which reproduces various environments of plants.

10995* Use of an Anion Exchange Resin to Eliminate Anion Interference in Calcium Determination by Flame Photometry. Fred Adams and R. D. Rouse. *Soil Science*, v. 83, Apr. 1957, p. 305-312.

10996* Agrobiologic Percentage Method of Evaluating Fertilizer Tests. V. Application to an Experiment on the Joint Effects of Nitrogen Fertilizer and Rates of Planting; Theory of Barrenness in Corn. O. W. Willcox. *Soil Science*, v. 83, Apr. 1957, p. 313-324.

10997 Electrodusting. N. G. Shreeve. *World Crops*, v. 9, May 1957, p. 205-206.

A new technique for applying protective dusts to plants, whereby the dust will adhere to both sides of the leaf and there is a higher degree of adhesion.

See also: **11044** (soil fungi); **11120** (production of diammonium phosphate); **11142** (determination of Mg in plant material); **11158** (determination of phosphorus in fertilizers); **11173** (determination of pesticide residues on crops); **11174** (determination of Zn in plants and soils).

BIOCHEMISTRY AND BIOPHYSICS

10998 The α-Chymotrypsin-Catalyzed Hydrolysis of a Series of Hydrazides. I. Determination of *p*H Optima and Their Dependence Upon Temperature. Ralph Lutwack, Howard F. Mower, and Carl Niemann. *American Chemical Society, Journal*, v. 79, May 5, 1957, p. 2179-2184.

10999 Synthesis of Potential Anticancer Agents. III. Hydrazino Analogs of Biologically Active Purines. John A. Montgomery and Lee B. Holum. **IV. 4-Nitro-and 4-Amino-5-Imidazole Sulfones.** L. L. Bennett, Jr. and Harry T. Baker. *American Chemical Society, Journal*, v. 79, May 5, 1957, p. 2185-2191.

11000 Alkaloid Studies. XVII. The Structure of the Cactus Alkaloid Pilocereine. Carl Djerassi, S. K. Figdor, J. M. Bobbitt, and F. X. Markley. *American Chemical Society, Journal*, v. 79, May 5, 1957, p. 2203-2210.

Pilocereine consists of two tetrahydroisoquinoline nuclei fused by an ether linkage. Its exact structure was elucidated by diaryl ether cleavage of pilocereine methyl and ethyl ether with K in liquid ammonia and identification of all of the cleavage products.

11001 Vasodilator and Adrenergic Blocking Agents. I. 1,4-Disubstituted Piperazines and Related N-Phenylethylenediamine Derivatives. F. L. Bach, Jr., H. J. Brabander, and S. Kushner. *American Chemical Society, Journal*, v. 79, May 5, 1957, p. 2221-2225.

Syntheses and physiological properties. Importance of the phenyl and pyridylpiperazine nuclei in developing strong adrenergic blocking agents of this type.

11002 Phosphopeptides Obtained by Partial Acid Hydrolysis of α-Casein. N. J. Hipp, M. L. Groves, and T. L. McMeekin. *American Chemical Society, Journal*, v. 79, May 20, 1957, p. 2559-2565.

The dipeptides found in a partial hydrolysis of α-casein are resolved.

11003 Synthesis of Some Model Pyrimidine Nucleosides. H. Todd Miles. *American Chemical Society, Journal*, v. 79, May 20, 1957, p. 2565-2568.

Preparation of some M-alkyl and O-alkyl pyrimidine nucleosides are described.

11004 The Formation of 2,7-Anhydro-β-D-*manno*-heptulopyranose by the Action of Acid on D-*manno*-Heptulose and of Alkali on Phenyl α-D-*manno*-Heptulopyranoside; also 1,6-Anhydro-β-D-Mannopyranose From D-Mannose in Acid Solution. Emmanuel Zissis, Laura C. Stewart, and Nelson K. Richtmyer. *American Chemical Society, Journal*, v. 79, May 20, 1957, p. 2593-2597.

11005 Fungistatic Actions of Estrogens and Related Compounds. Lauretta E. Fox, William R. Carroll, and Johanna Glacy. *American Pharmaceutical Association, Journal (Scientific Ed.)*, v. 46, May 1957, p. 276-278.

Twenty-four estrogens or related compounds were tested for fungistatic actions *in vitro* against eight species of pathogenic fungi. All the natural estrogens were inactive. The only derivative of a natural estrogen which produced any action was ethinyl estradiol. Of the synthetic compounds tested, diethylstilbestrol was more active.

11006* A Method for Studying Antibiotic Diffusion in Agar. Thomas D. Brock. *Antibiotics & Chemotherapy*, v. 7, May 1957, p. 243-246.

Test data are given for clavacin, which is a rapid diffuser, and neomycin, which is a poor diffuser.

11007* Studies on the Sensitivity and Effect of Penicillin on Oral Lactobacilli. George W. Burnett. *Applied Microbiology*, v. 5, Mar. 1957, p. 82-86.

Most of the human oral strains are resistant to 0.5 unit of penicillin per ml. of BHI broth but susceptible to 1.0 unit. The cultures became more susceptible to penicillin as the acidity of the medium was increased. Development of resistance was associated with changes in morphology, gram staining, and fermentative ability.

11008* The Use of a Fluorimeter in the Characterization of Fluorescing Substances Elaborated by *Azotobacter*. Donald B. Johnstone. *Applied Microbiology*, v. 5, Mar. 1957, p. 103-106.

11009* The Critical-Orifice Liquid Impinger as a Sampler for Bacterial Aerosols. W. B. Cown, T. W. Kethley, and E. L. Fincher. *Applied Microbiology*, v. 5, Mar. 1957, p. 119-124.

Reproducibility and ease of use and manufacture of these samples commend their use in the collection of airborne bacteria under a variety of conditions of particle size, relative humidity, temperature, periods of sampling, and concentrations of the bacteria.

11010* The Reaction of *o*-Iodosobenzoate With 3-Phosphoglyceraldehyde Dehydrogenase. Gale W. Rafter. *Archives of Biochemistry and Biophysics*, v. 67, Apr. 1957, p. 267-271.

Yeast and muscle 3-phosphoglyceraldehyde dehydrogenases were found to react with 6 and 11 moles of *o*-iodosobenzoate, respectively, per mole of protein. The *o*-iodosobenzoate-treated muscle enzyme gained a high phosphatase activity toward acetyl phosphate, although it no longer catalyzed the oxidation of glyceraldehyde. On addition of cysteine the ability of the treated protein to catalyze the oxidation of glyceraldehyde was restored.

11011* The Flavonoid Constituents of *Spirodela oligorrhiza*. II. The Flavone Constituents. Leonard Jurd, T. A. Geissman, and M. K. Seikel. *Archives of Biochemistry and Biophysics*, v. 67, Apr. 1957, p. 284-297.

11012* A Comparison of the Cytochrome Structure and Radiation Effects in *Azotobacter*. Charles R. Goucher and W. Kocholaty. *Archives of Biochemistry and Biophysics*, v. 68, May 1957, p. 30-38.

The possession of certain cytochromes is associated both with the ability of cells to react under irradiation and the sensitivity of the respiratory system to ultra-violet light.

11013 Blood Group Substances. Their Chemistry and Immunochemistry. Elvin A. Kabat. 330 p. 1956. Academic Press, New York. (QP91 K11b)

Methods and reagents used in testing for blood group antibodies and antigens. Sources, purification, chemical composition, structure, biological effects, uses, and properties of blood group substances. Blood group antibodies and their biological effects.

11014 A Study of Steroid Color Reactions in Strong Acid. J. H. Linford. *Canadian Journal of Biochemistry and Physiology*, v. 35, May 1957, p. 299-325.

Attempts to deduce the type of resonant system responsible for the absorption of light, in order to present a unified explanation of this type of steroid color reaction. Bands in the visible and ultra-violet regions are correlated with the existence of specific chemical groups.

11015 Nitro-Compounds as Amoebicides. I. Compounds Related to 2-*Di*-(2-Hydroxyethyl)Amino-5-Nitropyridine. A. R. Brown, F. C. Copp, and A. R. Elphick. *Chemical Society*, Journal, Apr. 1957, p. 1544-1548.

The discovery that 2-di-(2-hydroxyethyl)amino-5-nitropyridine is amoebicidal prompted the preparation of a number of related compounds by known methods. With certain exceptions, Mangini's method was suitable for reaction of 2-chloro-5-nitropyridine and the appropriate bases, including esters of amino acids.

11016 Actinomycin. III. The reaction of Actinomycin With Alkali. S. J. Angyal, E. Bullock, W. G. Hanger, W. C. Howell, and A. W. Johnson. **IV. An Oxidative Degradation of Actinomycin.** B. E. Bullock and A. W. Johnson. *Chemical Society, Journal*, Apr. 1957, p. 1592-1607.

11017 Chemistry of the Higher Fungi. VIII. A Series of Acetylenic Compounds From *Polyporus Anthracophilus*. J. D. Bu'Lock, E. R. H. Jones, and W. B. Turner. *Chemical Society, Journal*, Apr. 1957, p. 1607-1617.

Separation and characterization of a series of acetylenic derivatives of n-decane and n-octane, metabolic products of Basidiomycete P. *anthra-cophilus*.

11018 The Search for Chemotherapeutic Amidines. XIII. α ω-Di-*p*-Amidinophenoxy-Alkenes and -Alkynes. J. N. Ashley and R. D. MacDonald. *Chemical Society, Journal*, Apr. 1957, p. 1668-1671.

Some α ω-di-*p*-amidinophenoxy-alkenes and -alkynes and their nuclear-substituted derivatives were prepared for comparison with the saturated analogues. They are of no interest as trypanocides.

11019 The Chemistry and Functions of Vitamin B_{12}. E. Lester Smith. *Chemistry & Industry*, no. 19, May 11, 1957, p. 572-577.

11020* Alpha- and Beta-Lipoprotein Cholesterol. Method of Rapid Quantitative Determination. F. S. Nury and Elizabeth R. B. Smith. *Clinical Chemistry*, v. 3, Apr. 1957, p. 110-115.

11021 Clinical Use of Radioisotopes. William H. Beierwaltes, Philip C. Johnson, and Arthur J. Solari. 456 p. 1957. W. B. Saunders Co., Philadelphia. (RM859 B39c)

Uses of radioactive I, Au, P, Cr, Co, Fe, and other less commonly used isotopes. Biologic effects of radiation. Starting and managing a clinical radioisotope unit. Instrumentation.

11022 Proteolytic Enzymes From *Pseudomonas Putrefaciens*. I. Characteristics of an Extracellular Proteolytic Enzyme System. W. C. Van Der Zant. **II. Characteristics of an Endocellular Proteolytic Enzyme System.** B. J. Camp and W. C. Van Der Zant. *Food Research*, v. 22, Mar.-Apr. 1957, p. 151-163.

11023 Effect of the Plating Medium on the Survival of Heat-Treated Cells of *Pseudomonas Fluorescens*. C. D. Heater and W. C. Van Der Zant. *Food Research*, v. 22, Mar.-Apr. 1957, p. 164-169.

11024* (German.) Investigation of Behavior of Heavy Elements in Animals With Experimental Tumors. **Untersuchungen über das Verhalten schwerer Elemente bei Tieren mit experimentellen Tumoren. I.** Inorganic and Organic Bismuth-206 Compounds in Yoshida and Ehrlich-Acites Tumors. **Anorganische und organische Wismut^{206}-Verbindungen bei Yoshida- und Ehrlich-Acites-Tumors.** F. Passalacqua. *Fortschritte auf dem Gebiete der Röntgenstrahlen*, v. 86, May 1957, p. 623-626.

11025* Cytological Analysis of X-Ray-Induced Mutations at Eight Specific Loci in the Third Chromosome of Drosophila Melanogaster. Calvin L. Ward and Mary L. Alexander. *Genetics*, v. 42, Jan. 1957, p. 42-54.

11026 (German.) Synthesis of Gramicidin S. **Die Synthese von Gramicidin S.** R. Schwyzer and P. Sieber. *Helvetica Chimica Acta*, v. 40, no. 3, 1957, p. 624-639.

Synthesis of this peptide antibiotic obtained from *Bac. brevis* proves the structure of gramicidin S to be a cyclic decapeptide.

11027 Hormones, Brain Function, and Behavior. Hudson Hoagland, editor. 257 p. 1957. Academic Press, New York. (RC327 H65h)

Papers from a conference on neuroendocrinology deal with effects of steroid hormones on the nervous system; sex hormones and behavior; serotinin, opinephrine, and their metabolites in relation to experimental psychiatry; the thyroid and behavior.

11028* Chemical Studies on Indian Seaweeds. III. Partition of Sulphur and Its Relation to the Carbohydrate Content. V. Krishna Pillai. *Indian Academy of Sciences, Proceedings*, v. 45, sec. B, Mar. 1957, p. 101-121.

Partition of S in 11 common seaweeds was studied in relation to polysaccharide content and distribution.

11029 Toxicity of Alpha, Beta-Unsaturated Carbonyl Compounds to Microorganisms. Vernon T. Stack, Jr. *Industrial and Engineering Chemistry*, v. 49, May 1957, p. 913-917.

11030* A Taxonomic Study of the Genus *Spirillum* Ehrenberg. Marion A. Williams and S. C. Rittenberg. *International Bulletin of Bacteriological Nomenclature and Taxonomy*, v. 7, Apr. 1957, p. 49-111.

Reviews studies of the above (now known as *Spirillum volutans* Ehrenberg, 1830). Culture, physiology, metabolism, cytology, and classification are covered.

11031* Some Microbiological Aspects of Radiation Sterilization. George J. Fuld, Bernard E. Proctor, and Samuel A. Goldblith. *International Journal of Applied Radiation and Isotopes*, v. 2, Apr. 1957, p. 35-43.

Pure suspensions of bacteria were irradiated both by cathode and gamma rays from cobalt-60. Effects of pH, atmosphere during irradiation, type of radiation, and state of the medium on the radiosensitivities of the organisms.

11032 Biological Evaluation of Agricultural and Food Chemicals. Lloyd W. Hazleton. *Journal of Agricultural and Food Chemistry*, v. 5, May 1957, p. 336-339.

Procedures and economics involved.

11033 Uptake of I^{131} by Gram Positive and Gram Negative Bacteria. Charles W. Johnson, Thomas E. Shockley, and Thomas W. Johnson. *Journal of Bacteriology*, v. 73, Mar. 1957, p. 314-317.

A method that uses I^{131} for studying the role of I in the gram reaction is described.

11034 Growth-Enhancing Factor for Human Tubercle Bacilli Using Minute Inocula. Isao Yamane. *Journal of Bacteriology*, v. 73, Mar. 1957, p. 334-337.

Using a crystalline growth-enhancing factor isolated from egg yolk, a thermostable synthetic agar medium was devised for the detection of tubercle bacilli.

11035 Bactericidal Action of Oleic Acid for Tubercle Bacilli. I. Quantitative and Analytical Survey of the Action. II. Morphological Response. Kazumori Minami. *Journal of Bacteriology*, v. 73, Mar. 1957, p. 338-352.

11036 Studies on the Metabolism of *Shigella*. I. The Occurrence of a Tricarboxylic Acid Cycle in *Shigella flexneri*. Sylvia F. Pan, Robert Yee, and Horace M. Gezon. *Journal of Bacteriology*, v. 73, Mar. 1957, p. 402-409.

Cell-free extracts obtained from aerobically grown *Shigella flexneri* 3 are able to oxidize all of the members of the tricarboxylic acid cycle except acetate.

11037 New Technique of Growing Molds in Slide Culture Under Environmental Conditions Similar to Those Prevailing in the Petri Dish. Georges Knaysi. *Journal of Bacteriology*, v. 73, Mar. 1957, p. 431-435.

11038 Quantitative Evaluation of the Effects of Various Methods of Fixation on the Appearance of Stained Structures in the Bacterial Cell. H. I. Adler and M. R. Zelle. *Journal of Bacteriology*, v. 73, Apr. 1957, p. 526-529.

Method based on the counting and classification of large random samples of Feulgen stained nuclear structures was developed which permits a critical and objective evaluation of fixation procedures.

11039 Inhibition Steps in Sulfonamide Bacteriostasis of *Escherichia Coli*. H. R. Alimchandani and A. Sreenivasan. *Journal of Bacteriology*, v. 73, Apr. 1957, p. 538-543.

Reversal of sulfadiazine (SD) growth inhibition in *Escherichia coli* Macleod strain was examined with several metabolites functionally related to *p*-aminobenzoic acid. Vitamin B_{12} and glycine, or to a lesser extent threonine, were essential to obtain reversal at high concentrations of SD.

11040* Studies on Immunity to Toxins of *Clostridium Botulinum*. II. Production and Purification of Type B Toxin for Toxoid. James T. Duff, Julius Klerer, Richard H. Bibler, Dorothy E. Moore, Carl Gottfried, and George G. Wright. *Journal of Bacteriology*, v. 73, May 1957, p. 597-601.

11041* Agar Medium to Define Acid Producing Bacteria. J. L. Shank and J. H. Silliker. *Journal of Bacteriology*, v. 73, May 1957, p. 625-626.

Introduces an improved medium designed to correlate acid production with a single colony.

11042 Preparation of Some Aminotrifluoromethyldiphenyl Sulfones as Possible Antibacterial Agents. Gardner W. Stacy, C. Richard Bresson, Robert E. Harmon, and Richard C. Thamm. *Journal of Organic Chemistry*, v. 22, Mar. 1957, p. 298-302.

Preparation by way of the corresponding intermediate nitro sulfones and sulfides. The 4,4'-diamino-3-trifluoromethyldiphenyl sulfone showed appreciable antibacterial activity, confirming the principle that amino groups in diphenyl sulfones must be situated in both *para*-positions for appreciable activity.

11043 Potential Antimicrobial Agents. I. Alkyl 4-Oxo-2-Alkenoates. II. 4-Hydroxy-2,4-Alkadienoic Acid γ-Lactones. III. 4-Methylamino-2,4-Alkadienoic Acid γ-Lactams. Henry M. Walton. *Journal of Organic Chemistry*, v. 22, Mar. 1957, p. 308-318.

11044 A Manual of Soil Fungi. Joseph C. Gilman. 2nd Rev. Ed. 450 p. 1957. Iowa State College Press, Ames. (QR111 G42m2)

Descriptions of soil fungi are reported as an aid in their identification.

11045 Methods of Biochemical Analysis. David Glick, editor. v. IV. 362 p. 1957. Interscience Publishers, New York. (QP519 M56 Vis.)

Methods for determining carotene, vitamin A, polyunsaturated fatty acids, 17,21-dihydroxy-20-ketosteroids, sulfatases, serum acid phosphatases, amino acids, and succinic dehydrogenase activity. The pH-stat and its use in biochemistry.

11046 Biochemistry of the Bacterial Cell Wall. Elizabeth Work. *Nature*, v. 179, Apr. 27, 1957, p. 841-847.

Inference is that bacterial cell walls, in the case of the Gram-positive organisms at least, consist of an insoluble basal groundwork of chains of acetylated glucosamine and muramic acid, bound in unspecified ways to peptides which may be highly cross-linked or cyclic; polysaccharide units and phosphorylated compounds may also be attached.

11047 Refractometry and Interferometry of Living Cells. Robert Barer. *Optical Society of America, Journal,* v. 47, June 1957, p. 545-556.

By combining interference microscopy and immersion refractometry it becomes possible to measure the cell thickness and hence to calculate dry and wet mass, volume, and water content.

11048* The Multiplication of Tobacco Mosaic Virus in the Presence of Cucumber Mosaic Virus or Tobacco Ringspot Virus in Tobacco. Carlos Garces-Orejuela and Glenn S. Pound. *Phytopathology,* v. 47, Apr. 1957, p. 232-239.

Suggests that cucumber mosaic virus indirectly induces an initial retardation of tobacco mosaic virus synthesis, altering the multiplication pattern of the latter virus. Neither virus completely inhibited the multiplication of the other.

11049* Nonionizing Radiant Energy as an Agent in Altering the Incidence of X-Ray-Induced Chromatid Aberrations. I. Effects of Far-Red and Infrared Radiant Energy on *Tradescantia* and *Vicia*. R. B. Withrow and C. C. Moh. *Radiation Research,* v. 6, Apr. 1957, p. 491-500.

11050* Inactivation of Infectious Nucleic Acid From Tobacco Mosaic Virus by Ultraviolet Light (2537 A). A. Douglas McLaren and William N. Takahashi. *Radiation Research,* v. 6, May 1957, p. 532-542.

Infectious nucleic acid from TMV is inactivated by ultraviolet light (2537 A) with a minimum quantum yield of 3×10^{-4}. Inactivation takes place without a reduction in intrinsic viscosity but with a slight reduction in optical density at 2600 A.

11051* An Electrical Analogue for Analysis of Tracer Distribution Kinetics in Biological Systems. J. R. MacDonald, E. G. Perry, L. L. Madison, and D. W. Seldin. *Radiation Research,* v. 6, May 1957, p. 585-601.

Describes instrument designed to solve rapidly and accurately the problem of transfer of a tracer substance from one fluid compartment in a biological system into as many as four other compartments.

11052 The Ergot Alkaloids. *Research Today,* v. 13, no. 1, 1957, p. 3-18.

Structure of lysergic acid and of the ergot alkaloids. Total synthesis of lysergic acid and of ergonovine. Production of new ergot alkaloids by fermentation methods. The psychopharmacology of lysergic acid diethylamide.

11053* Transformation of Fibroma Into Myxoma Virus in Tissue Culture. Lawrence Kilham. *Society for Experimental Biology and Medicine, Proceedings,* v. 95, May 1957, p. 59-62.

Myxoma virus inactivated by heating at 65 to 67 C was used as the transforming agent in the transformation of fibroma into myxoma virus in cultures of rabbit tissues.

11054 The Effect of Propyl Thiouracil in the Recovery of Rat Thyroid Gland From Irradiation With Astatine-211. Patricia W. Durbin, C. Willet Asling, Muriel E. Johnston, and Joseph G. Hamilton. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission),* UCRL-3606, Feb. 1957, 22 p. (UF767 U3u Contin.)

11055 Metabolic Studies With Strontium-90 in the Rhesus Monkey. Patricia W. Durbin, et al. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission),* UCRL-3634, Jan. 1957, 26 p. (UF767 U3u Contin.)

11056 The Visualization of Individual Lipoprotein Macromolecules in the Electron Microscope. Thomas L. Hayes and John E. Hewitt. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission),* UCRL-3681, Feb. 1957, 12 p. (UF767 U3u Contin.)

11057 The Effect of Highly Irradiated Food Medium on Life Span and Development of Drosophila Melanogaster. Betty Jo Henderson, R. C. Baxter, and L. W. Tuttle. *University of Rochester (U. S. Atomic Energy Commission),* UR-483, Apr. 1957, 80 p. (UF767 Un3.1ru Contin.)

Studies of longevity, fecundity, egg hatchability, and body weights of several thousand flies disclosed no significant detrimental changes in characteristics when evaluated at the 95% significance level.

11058* Electron Microscopical Studies of Phage Multiplication. I. A Method for Quantitative Analysis of Particle Suspensions. Edouard Kellenberger and Werner Arber. **II. Production of Phage-Related Structures During Multiplication of Phages T2 and T4.** Edouard Kellenberger and Janine Séchaud. **III. Observation of Single Cell Bursts.** Grete Kellenberger and Edouard Kellenberger. *Virology,* v. 3, Apr. 1957, p. 245-285.

11059* The Inactivation of the Bacterial Killing Property In T2 Bacterial Virus by Ionizing Radiation. Jane Setlow. *Virology,* v. 3, Apr. 1957, p. 374-379.

See also: **10990** (virus disease of butterfly larvae); **10995** (Ca determination by flame photometry); **11156** (chromatography of deoryribonucleic acids); **11232** (anthelmintic compounds); **11322** (protection of CMC solutions from microbiological attack); **11676** (microbiology of canned food).

CERAMICS AND CONCRETE

11060 Cutting and Grinding Ceramics. R. F. Rea and J. W. Ripple. *American Ceramic Society Bulletin,* v. 36, May 1957, p. 163-167.

With modern grinding facilities and techniques, finish tolerances of ±0.0001 or better may be obtained. Grinding also provides improved surface finishes, the quality of which depends on the abrasive used, the body being ground, and grinding practices.

11061 Differential Thermal Analysis Technique for Determining Curie Points. S. L. Blum, A. E. Paladino, and L. G. Rubin. *American Ceramic Society Bulletin,* v. 36, May 1957, p. 175-176.

Apparatus for making differential thermal analysis runs in an atmosphere at elevated temperatures. Techniques for Curie point determination on some typical ferromagnetic and ferroelectric ceramic materials.

11062 Effects of Ceramic Parameters on Microwave Properties of Nickel Ferrite. S. L. Blum, J. E. Zneimer, and H. Zlotnick. *American Ceramic Society, Journal,* v. 40, May 1957, p. 143-149.

Preparation, firing characteristics, and physical properties of $NiFe_2O_4$. Pores in the ferrite body substantially increase the width of the ferromagnetic resonance curve. The d.c. resistivity can be made to vary from 10 ohm-cm. to 10^9 ohm-cm. by changing the firing temperatures.

11063 Stress Measurement in Cylindrical Vessels. H. N. Ritland. *American Ceramic Society, Journal,* v. 40, May 1957, p. 153-158.

An analysis of the birefringence patterns observed in the walls of cylindrical glass objects when viewed tangentially in a matching index fluid. A simple method whereby the stresses at the outside and inside surfaces of tempered ware can be calculated from the observed pattern.

11064 Reaction Between K_2O and Al_2O_3-SiO_2 Refractories as Related to Blast-Furnace Linings. S. E. McCune, T. P. Greaney, W. C. Allen, and R. B. Snow. *American Ceramic Society, Journal,* v. 40, June 1957, p. 187-195.

Peeling of fire-clay brick in the upper stack regions of a blast furnace occurs with 5 to 10% K_2O, whereas in the higher-temperature regions, peeling occurs with 20 to 30% K_2O. Repeated treatment of high-duty and 70% alumina brick with KCL-K_2CO_3 mixtures did not produce peeling at 1600 F.

11065 Effect of Some Lithium Compounds on Sintering of MgO. Leon M. Atlas. *American Ceramic Society, Journal,* v. 40, June 1957, p. 196-199.

The admixture of 0.25 or more weight % of a Li salt, particularly LiF, LiCl, or LiBr, lowers the effective sintering temperature of high-purity MgO to 1300 to 1400 C. Catalytic action of the Li salts is greatest when they are used with

magnesias which have a particle size less than 0.5μ and a surface area of 30 sq. meters per gm. or higher.

11066 Physical and Electrical Properties of a Nickel Ferrite as Affected by Compositional Changes. S. L. Blum and J. E. Zneimér. *American Ceramic Society, Journal*, v. 40, June 1957, p. 208-211.

11067* Mortar- and Concrete-Making Properties of Natural Sands Related to Their Physical Attributes. C. F. Zeitsman. *American Concrete Institute, Journal*, v. 28, May 1957, p. 1041-1056; *ACI Proceedings*, v. 53, 1957, p. 1041-1056.

Methods for determining mean particle size (fineness modulus), particle size distribution, particle shape, and solid content of natural sands. Relation of these properties to the water requirements of mortars and concretes.

11068* (German.) Wetting by Salt Melts. **Benetzung durch geschmolzene Salze.** H. v. Wartenberg. *Angewandte Chemie*, v. 69, Apr. 21, 1957, p. 258-262.

Wetting depends on the presence of O in an ionized state.

11069* (Japanese.) **Study on the Cutting of Sheet Glass. I-II.** Morihisa Hara and Junn Nakayama. *Asahi Glass Company, Reports of the Research Laboratory*, v. 6, no. 1, 1956, p. 1-11; no. 2, p. 109-118.

When cutting speed is reduced to under 10 cm. per sec., the depth gradually decreases, showing a tendency similar to that described in the bending strength test made by Holland and Turner; other effects are evaluated.

11070* (Japanese.) **Study on Components of Gases in Glass. VI. Absorbing Phenomena of CO in Molten Glass. VII. Effect of Argon on Molten Glass at High Temperature.** Tsuneo Okamura. *Asahi Glass Company, Reports of the Research Laboratory*, v. 6, no. 2, 1956, p. 75-97.

11071* Ceramic Bodies With Small Expansion Co-Efficients. II. Felix Singer and Sonja S. Singer. *British Clayworker*, v. 66, May 1957, p. 41-45.

A compilation of data on the composition and properties of cordierite bodies; also coefficients of expanison and cone melting points of some low expansion bodies not based on cordierite. (To be continued.)

11072 Ball Mills and Ball Milling. I. T. G. Callcott. *British Coal Utilisation Research Association, Monthly Bulletin*, v. 21, May 1957, p. 101-120.

Description and performance of mills; grinding circuits; power requirements; wear of grinding media. (To be concluded.)

11073 An Investigation of Some Barium Titanate Compositions for Transducer Applications. D. Schofield and R. F. Brown. *Canadian Journal of Physics*, v. 35, May 1957, p. 594-607.

Addition of Co to 5% $CaTi_3$-95% BaTiO compositions produces a large reduction in the loss in high fields without significantly affecting the piezoelectric constants.

11074 Aluminum Panels Pass Fire Tests. R. W. Ricker and C. R. Manley. *Ceramic Industry*, v. 68, June 1957, p. 95 + 3 pages.

Composite porcelain enameled Al alloy panels with concrete backing were not damaged in a fire test simulating a minor tunnel fire (1200 F. for 6 min.). Only tests at 1575 to 1600 F damaged panel beyond usefulness.

11075 Clays and Clay Minerals. W. O. Milligan, editor. 573 p. 1955. National Academy of Sciences, National Research Council, Washington, D. C. (TN941 N21c)

A compilation of papers on variosu subjects representing the latest developments in clay mineralogy.

11076 Composition and Properties of Concrete. George Earl Troxell and Harmer E. Davis. 434 p. 1956. McGraw-Hill, New York. (TA439 T75c)

Proportioning, production, testing, and control procedures. Laboratory tests illustrating the most important facts and principles connected with the use of cement, aggregate, and concrete. Properties of ordinary and special concretes.

11077* Applications for Glass Materials and Components. James K. Davis. *Electrical Manufacturing*, v. 59, June 1957, p. 151 + 6 pages.

From electron tube envelope to nuclear radiation detecting devices, technical glass fills a wide spectrum of vital and primary needs as an engineering material in the design of electrically energized equipment, appliances, and machines. Glass as a structural material; glass electronic and electrical components; glass for special-purpose application.

11078 Importance of the Spinel Phase in the Steel Industry. II. E. F. Osborn. *Industrial Heating*, v. 24, May 1957, p. 1003 + 3 pages.

Influence of spinel in chromite and silica refractories used in steel plants. (To be continued.)

11079* A Mathematical Analysis of the Internal Dynamics of the Ball Mill on the Basis of Probability Theory. H. E. Rose. *Institution of Chemical Engineers, Transactions*, v. 35, no. 2, 1957, p. 87-97.

11080* The Preparation of Magnesium-Manganese Ferrite for Microwave Applications. A. E. Robinson. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, Suppl. no. 5, 1957, p. 159-164.

11081* A New Class of Oxidic Ferromagnetic Materials With Hexagonal Crystal Structures. G. H. Jonker, H. P. J. Wijn, and P. B. Braun. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, Suppl. no. 5, 1957, p. 249-254.

New materials are obtained as reaction products of Fe_2O_3, BaO, and MeO in various proportions, where Me denotes, in general, an element of the first transition group, or either Mg or Zn. Polycrystalline sintered samples of such compounds show an initial permeability of about 10; the permeability remains substantially constant up to about 1000 Mc. per sec.

11082 Plastic Refractory in Slab Heating Furnaces. Robert A. Smith. *Iron and Steel Engineer*, v. 34, May 1957, p. 99-103.

Plastic refractory installations provide greater furnace availability, enable harder forcing of furnace, secure greater output, and reduce premature refractory failure.

11083* Measurement of the Specific Surface & Covering Capacity of Graphite Powders. B. R. Marathe and G. D. Joglekar. *Journal of Scientific & Industrial Research*, v. 16, sec. A, Jan. 1957, p. 23-28.

The covering capacity, particle thickness and specific surface of natural graphite samples from four different sources and in three different particle size ranges, generally used in crucible manufacture, were determined. Acicularity and isoproportionality coefficients were evaluated.

11084* (German.) Thixotropy in Kaolinite and Cristalline Expansion in Montmorillonite. Effect of the Exchangeable Cations of the Liquid and of the Electrolyte of an Aqueous Solution. **Thixotropie bei Kaolinit und innerkristalline Quellung bei Montmorillonit. Wirkung der austauschfähigen Kationen, der Flüssigkeit und der Elektrolyte einer wässrigen Lösung.** U. Hofmann, R. Fahn, and Armin Weiss. *Kolloid-Zeitschrift*, v. 151, Apr. 1957, p. 97-115.

11085 Cement and Aggregates for Shielding in Atomic Energy Plants. Harold S. Davis. *Mining Engineering*, v. 9, May 1957, p. 544-548.

Using high-density concrete often reduces plant costs and improves operation efficiency.

11086 Thermal Fracture of Noncircular Ceramic Cylinders. E. M. Baroody. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, TID-7530, Apr. 1957, p. 161-163. (UF767 Un3ti Contin.)

Theoretical and experimental work indicate that the nonaxial heat flow per unit length, W_{max}, required to fracture a hollow ceramic cylinder could be represented by the product of two separate factors, M and S characterizing the material and the shape, respectively. The relationship $W_{max} = MS$ is shown to be valid for cylinders having circular, square, or triangular outer peripheries.

11087 Ceramic Information Meeting Held at Oak Ridge National Laboratory on October 1, 2 and 3, 1956. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, TID-7530, pt. 1, Apr. 1957, 163 p. (UF767 Un3ti Contin.)

Papers on various ceramic materials for reactor use, some of which are abstracted separately.

11088* The Formation of Ducts in Concrete. F. E. Jones. *Rubber Developments,* v. 10, Spring 1957, p. 2-6.

Rubber pneumatic tubing is used to form continuous ducts in hollow concrete slabs and beams for floors and roofs to save weight and increase thermal insulating capacity.

11089 Evaluation of the Engineering Properties of Titanium Carbide Base Cermets. John C. Redmond, Robert J. Reintgen, James R. Fenton, and Maurice E. Simon. *Wright Air Development Center Power Plant Laboratory, WADC Technical Report* 57-25, July 1956, 60 p. (TL507 Un3.18w Vis.)

Tensile stress-strain tests indicate some newer compositions with a Ni-Cr-W alloy phase to have much more toughness than heretofore available with useful high-temperature strength up to 1800 F. Stress-to-rupture testing revealed some compositions possessing 100-hr. strength of 18,000 psi. at 1800 F.

See also: **11338** (decomposition of $PbCO_3$); **11385** (solubility of solids in gases); **11712** (microscopic petrography); **11714** (petrographic microscopy); **11911** (cupola lining refractories); **12149** (radiation damage in graphite); **12168** (properties of refractory uranium compounds); **12256** (properties of ferrites); **12348** (cement-kiln dust reclamation).

CHEMICAL ENGINEERING

11090* Review of Experiences With Microstrainer Installations. George R. Evans. *American Water Works Association, Journal,* v. 49, May 1957, p. 541-552.

Advantages include low initial costs and small compact layouts; low-powered driving units; small head losses; high flow ratings; automatic and continuous cleansing; easy operation and intermittent supervision; high quality corrosion-resisting materials; minimum replacements.

11091* Bibliography on Aerosols, 1950-1955. Report COO-1016 (Suppl. to Report SO-1003). W. J. Scheffy, compiler. 109 p. 1956. Engineering Experiment Station, University of Illinois, Urbana. (Z7914 IL6.8bs Ref.)

Includes 947 refrences to books and articles dealing with aerosols and related systems. Includes data on properties, preparation and formation, coagulation, determination, collection, air pollution, and meteorology.

11092* The Tedman Separator. D. Tedman. *British Chemical Engineering,* v. 2, May 1957, p. 245-247.

New type of centrifugal separator for particle size separations in the range ¼ in. to 0.1 mm. uses additional fluid to assist the separation process.

11093* Basic Principles of Cooling Tower Design. Derek J. Tow. *British Chemical Engineering,* v. 2, May 1957, p. 263-266.

11094* Fog Formation and the Design of Cooler-Condensers and Cooler-Absorbers. C. G. Gardner. *British Chemical Engineering,* v. 2, June 1957, p. 296-301.

Design calculations. Methods for preventing fog formation.

11095* (French.) Methane Cracking in a Tubular Reactor. **Craquage du méthane dans un réacteur tubulaire. I.** Effect of the Surface/Volume Relationship. **Effet du rapport surface/volume.** J. E. Germain and C. Vaniscotte. *Bulletin de la Société Chimique de France,* no. 5, May 1957, p. 692-695.

Methane cracking in a silica tubular reactor was studied at 1000 C under normal pressure. Janak's chromatographic method was used to analyze the reaction gases. Important effect of the S/V relationship in the reaction kinetics.

11096 New Statistical Method Rapidly Determines Optimum Process Condition. S. I. Neuwirth and L. M. Naphtali. *Chemical Engineering,* v. 64, June 1957, p. 238-242.

The Box-Wilson method minimizes the number of experiments required for determining an optimum point by taking the steepest slope path (in a number of sequential steps) to the summit.

11097 Process Control. *Chemical Engineering,* v. 64, June 1957, p. 249-320.

A review of the latest instrumentation, techniques, and data handling systems, including an extensive guide to process instrumentation elements.

11098 Automatic Control in Continuous Distillation. Theodore J. Williams and Rebert T. Harnett. *Chemical Engineering Progress,* v. 53, May 1957, p. 220-225.

Factors involved in the use of continuous analyzers are evaluated from a control dynamics standpoint.

11099 Jet Spray Dryer. E. W. Comings and C. L. Coldren. *Chemical Engineering Progress,* v. 53, May 1957, p. 231-236.

Unique spray dryer uses the venturi principle of the autocarburetor, has a drying chamber diameter of six inches.

11100 A Rigorous Graphical Method for Calculating Multicomponent Distillations. R. J. Hengstebeck and D. W. Schubert. *Chemical Engineering Progress,* v. 53, May 1957, p. 243-248.

Method minimizes the tray-to-tray calculations and avoids the matching problem.

11101* Studies on Gas-Solid Reactions. I. The Oxidation Rate of Zinc Sulphide. II. Causes of Thermal Instability. K. J. Cannon and K. G. Denbigh. *Chemical Engineering Science,* v. 6, Apr.-May 1957, p. 145-159.

11102* Mass Transfer Between Co-Current Fluid Streams and Boundary Layer Solutions. Owen E. Potter. *Chemical Engineering Science,* v. 6, Apr.-May 1957, p. 170-182.

Approximate laminar boundary layer solutions for mass transfer across the plane interface between two co-current parallel fluid streams are derived.

11103* Mercury Vapour Transfer Studies. I. R. W. Maxwell and J. Anderson Storrow. *Chemical Engineering Science,* v. 6, Apr.-May 1957, p. 204-214.

Preliminary tests demonstrate the versatility of Hg evaporation as a technique for the study of mass transfer systems. Use of a sensitive ultra-violet absorptiometer for measuring the concentration of Hg vapor in gas stream enables studies to be made of systems with hydrodynamic control.

11104* Diffusion in a Ternary Gas System With Application to Gas Separation. J. J. Keyes, Jr. and R. L. Pigford. *Chemical Engineering Science,* v. 6, Apr.-May 1957, p. 215-226.

Measurements are reported of the separation effected by diffusion of a gaseous mixture of H and N through two organic vapors for the cases of stagnant vapor and for countercurrent flow of the vapor relative to the H and N.

11105 Process-Control Problems Yield to the Analog Computer. C. W. Worley, R. W. E. Franks, and J. F. Pink. *Control Engineering,* v. 4, June 1957, p. 97-104.

Shows how a batch chemical process and a control system proposed for it were set up and solved by simulation of an analog computer.

11106 Centrifugal Boiler Compression Still. K. C. D. Hickman. *Industrial and Engineering Chemistry,* v. 49, May 1957, p. 786-800.

Still employs shallow, rapidly rotating cones of thin sheet metal over which the feed solution is spun in extremely thin layers, more than doubling the distillate obtainable from a given expenditure of power. Many tons of sea water were distilled without formation of scale.

11107 Mononitration of *p*-Cymene. Kenneth A. Kobe and Eugene M. Langworthy. *Industrial and Engineering Chemistry,* v. 49, May 1957, p. 801-806.

Yield is a sensitive function of process conditions. A yield of 89% can be obtained by nitration at 10 C, mole ratio HNO_3 to cymene of 0.9, weight ratio of H_2SO_4 to cymene of 0.9, weight ratio of H_2SO_4 of 85 wt.%, and intense agitation of the nitration mixture.

11108 Catalytic Hydrogenation of Methyl Laurate to Lauryl Alcohol. James M. Church and Mohamed A. Abdel-Gelil. *Industrial and Engineering Chemistry,* v. 49, May 1957, p. 813-817.

Effects of type, amount, and method of preparing catalysts, and also temperature, pressure, and degree of agitation on rate and extent of hydrogenation. A method of recycling of an

active, long-lived catalyst may provide a continuous process for rapidly converting most fatty acid esters to alcohols.

11109 Operating Variables in Hydrogenating Cottonseed Oil. Ibrahim A. Eldib and Lyle F. Albright. *Industrial and Engineering Chemistry*, v. 49, May 1957, p. 825-831.

A mechanism for selectivity is proposed, based on preferential physical adsorption of linoleic instead of oleic acid.

11110 Effect of Process Conditions on Formation of Isomers in Nitration of Chlorobenzene. Harold H. Bieber and W. Fred Schurig. *Industrial and Engineering Chemistry*, v. 49, May 1957, p. 832-837.

Proportion of *p*-nitrochlorobenzene formed is a function of nitration temperature and strength of final spent H_2SO_4.

11111 Vapor Phase Hydration of Ethylene Oxide. G. E. Hamilton and A. B. Metzner. *Industrial and Engineering Chemistry*, v. 49, May 1957, p. 838-846.

Mechanism and kinetics were studied on Amberlite IR-120 and IRC-50 cation exchange resins (H^+ form) as catalysts using catalyst particle diameters, 0.25 and 0.71 mm.; 110 to 200 C; modified Reynolds numbers, 10 to 60; molar ratios, steam-ethylene oxide, 7.5 to 32; and total pressure, 1.2 atm.

11112 Kinetics of the Ethyl Alcohol-Lactic Acid Reaction. Ralph A. Troupe and Emily Dimilla. *Industrial and Engineering Chemistry*, v. 49, May 1957, p. 847-855.

Studies with 85% lactic acid in sealed tubes have developed a rate equation useful in designing a flow reactor for esterification of lactic acid with ethyl alcohol; with 44% technical lactic acid, higher temperatures and catalyst concentrations are needed to lower reaction time to a commercially attractive level.

11113 Distribution of Metal Contaminants on Cracking Catalysts. J. E. McEvoy, T. H. Milliken, and G. A. Mills. *Industrial and Engineering Chemistry*, v. 49, May 1957, p. 865-868.

As metal contaminants cause serious decrease in catalyst selectivity, and the metals are concentrated on the exterior of the catalyst, it is important to maintain maximum catalyst size.

11114 Nitrogen Purification. Murray Reich and Harry Kapenekas. *Industrial and Engineering Chemistry*, v. 49, May 1957, p. 869-873.

A sodium dithionite scrubbing solution containing phosphate buffers and $ZnSO_4$ purified commercial N to less than 0.03% O.

11115 Radial Heat Transfer in Packed Beds. S. S. Kwong and J. M. Smith. *Industrial and Engineering Chemistry*, v. 49, May 1957, p. 894-903.

Radial temperature profiles were measured by passing air and ammonia through tubes packed with alumina and steel spheres. Effective thermal conductivities were calculated from temperature profiles at two bed depths.

11116 Cellulose Swelling Measured by Benzene Retention. George A. Richter, Lloyd E. Herdle, and Waino E. Wahtera. *Industrial and Engineering Chemistry*, v. 49, May 1957, p. 907-912.

Degree of swelling can be measured by determining the sorption of benzene after displacement of the polar reagent with liquid benzene.

11117 Use of Modern Developments in Fluid Mechanics to Aid Chemical Engineering Research. Richard R. Hughes. *Industrial and Engineering Chemistry*, v. 49, June 1957, p. 947-955.

Principles of fluid dynamics. Flow in pipes and beds. Behavior of drops and bubbles.

11118 Simultaneous Heat and Mass Transfer in Free Convection Numerical Solutions for a Vertical Plate. W. G. Mathers, A. J. Madden, Jr., and Edgar L. Piret. *Industrial and Engineering Chemistry*, v. 49, June 1957, p. 961-968.

For applications ranging from vaporization of spray droplets to performance of packed catalytic reactors, partial solutions of basic equations of transfer from a vertical plate to a fluid in free convection were obtained by using an analog computer, and experimental data was correlated for transfer from spheres to air.

11119* The Relationship of the Viscosity to the Settling Rate of Slurries. R. L. Whitmore. *Institute of Fuel, Journal*, v. 30, May 1957, p. 238-242.

From settling tests on slurries of sized fractions of a methylmethacrylate polymer powder sedimenting in aqueous solutions, the hydrodynamic volume of each fraction is calculated and shown to exceed the dry volume. Results are applied to viscosity measurements on similar powders and it is shown that under shear the liquid layer on the particles gives them properties similar to those of soft spheres.

11120 Production of Diammonium Phosphate by Continuous Vacuum Crystallization. J. G. Getsinger, E. C. Houston, and F. P. Achorn. *Journal of Agricultural and Food Chemistry*, v. 5, June 1957, p. 433-436.

Diammonium phosphate was produced on demonstration scale in a vacuum crystallizer. The product was a coarse crystalline material containing 21% of nitrogen and 53% of P_2O_5.

11121 Reactions of Alkylphenols Over Cracking Catalysts. I. Comparison of Catalysts and Study of Reaction Conditions. P. H. Given. *Journal of Applied Chemistry*, v. 7, Apr. 1957, p. 172-193.

11122 Pentane Dehydrogenation. H. Shalit, F. W. Kirsch, W. S. Briggs, and J. B. Maerker. *Oil and Gas Journal*, v. 55, May 20, 1957, p. 150 + 2 pages.

Though yields are somewhat smaller, the process is more flexible, and gives higher octanes than isomerization.

11123 Low-pH Receiver Waters Cut Corrosion. J. A. Biehl and E. A. Schnake. *Oil and Gas Journal*, v. 55, May 20, 1957, p. 157 + 5 pages.

Operation and corrosion studies of a crude-oil unit at high and low pH of overhead waters showed that the pH of the receiver waters should be reduced to about 4.3, with inhibitor injections varying from 10 to 15 p.p.m.

11124 Tidewater's Delaware Refinery. *Oil and Gas Journal*, v. 55, May 27, 1957, p. 159-201.

Facilities, processes, and flow patterns of new 130,000 bbl. installation.

11125* Liquid-Liquid Extraction. IX. Large Scale Extraction Apparatus. S. R. M. Ellis and D. C. Freshwater. *Perfumery and Essential Oil Record*, v. 48, May 1957, p. 261-263.

Mixer-settler type apparatus; column type apparatus; packed columns; perforated plate columns. Efficiency studies.

11126* Polymerisation of Light Hydrocarbons. II. Recent Progress in Refinery Processes. P. W. Sherwood. *Petroleum*, v. 20, May 1957, p. 183-186.

Some experimental catalysts are considered.

11127 Refining Process Glossary. George H. Unzelman and Charles J. Wolf. *Petroleum Processing*, v. 12, May 1957, p. 97-152.

Collection of 168 brief descriptions of all the important processes now in commercial use. They are grouped under 5 general and 25 specific types. Includes a listing of firms available to handle process design, mechanical engineering, and/or construction work for specific processes.

11128 When to Isomerize Pentane and Hexane Fractions. H. R. Grane, J. K. Ozawa, and G. R. Worrell. *Petroleum Refiner*, v. 36, May 1957, p. 172-176.

Hypothetical case shows that isomerization should be added when gasoline pool reaches 97.8. In Pentafining, it pays to split C_5's and C_6's for isomerization when C_6 content is below 55%.

11129 How Kaolin Works for Cat Cracking. D. Beyler, J. B. Maerker, and J. W. Schall. *Petroleum Refiner*, v. 36, May 1957, p. 213-215.

Commercial and pilot plant data which show how kaolin catalyst compares with other catalytic cracking catalysts.

11130 Propane Removes Asphalts From Crudes. H. N. Dunning and J. W. Moore. *Petroleum Refiner*, v. 36, May 1957, p. 247-250.

A batch method is used to study the effects of temperature and propane-oil ratios. The results may be applied to counter-current towers.

11131 Steam Batch Distillation Calculations. C. D. Holland and N. E. Welch. *Petroleum Refiner*, v. 36, May 1957, p. 251-253.

A new method for multicompent mixtures.

11132 Fluid Catalyst Design Data. II. Find Best Particle Size Distribution. Frederick A. Zenz. *Petroleum Refiner*, v. 36, May 1957, p. 261-265.

Discusses the influence of particle size distribution on fluidization characteristics.

11133 Pilot Plants, Models, and Scale-Up Methods in Chemical Engineering. Robert Edgeworth Johnstone and Meredith Wooldridge Thring. 307 p. 1957. McGraw-Hill, New York. (TP157 J65p)

A study of the many ways in which model theory and empirical extensions of it can be used in the deisgn of pilot plants and models, and in the interpretation and scaling up of experimental results.

11134* (Polish.) Effect of Temperature on the Yield and Quality of Shale Oil in Membraneless Outgassing. **Wpływ temperatury na wydajność i jakość oleju łupkowego przy bezprzeponowym odgazowaniu.** S. Tertil. *Prace Instytutów Ministerstwa Hutnictwa*, no. 1, 1957, p. 57-60.

Temperatures for the highest quality of products and highest plant efficiency were determined.

11135 Economic Methods of Controlling Evaporation of Water. K. L. Sutherland. *Research*, v. 10, May 1957, p. 198-204.

Two economical methods of using hexadencanol to restrict evaporation from open waters were developed.

11136 (French.) Processes for the Synthesis of Aromatic Hydrocarbons From Petroleum. **Les procédés de synthèse des hydrocarbures aromatiques an départ du pétrole.** C. Thonon. *Revue de l'Institut Français du Pétrole et Annales des Combustibles Liquides*, v. 12, Feb. 1957, p. 218-239.

Review of aromatization processes shows the trend to Pt catalytic reforming.

11137* The Causes of Tastes and Odors in Drinking Water. Richard D. Hoak. *Water & Sewage Works*, v. 104, June 1957, p. 243-247.

Odor thresholds of phenols and other organic compounds.

See also: **10979** (granulation of mixed fertilizers); **11072** (ball mills); **11079** (analysis of ball mix internal dynamics); **11642** (chemical industry facts); **11643** (chemical plant economics); **11661** (flow of ThO_2 slurries); **11688** (graphitization of carbon); **11689** (liquefaction of methane); **11743** (Russian chemical engineering literature); **11798** (packings for chemical pumps); **12106** (chemical aspects of nuclear power); **12230** (energy relationships in crushing solids); **12306** (nylon resin aerosol package); **12309** (unplasticized PVC as construction material); **12343** (gas scrubbing apparatus); **12474** (protective procedures for use of Hg).

CHEMISTRY—ANALYTICAL

11138 The Vibrational Spectra and Structure of Cyclobutene and Cyclobutene-d_6. R. C. Lord and D. G. Rea. *American Chemical Society, Journal*, v. 79, May 20, 1957, p. 2401-2406.

The infrared absorption spectra of both vapor and liquid were obtained. Raman spectra are also presented.

11139 The Determination of Benzoic Acid and Salicylic Acid Mixtures by Differential Nonaqueous Titration. M. I. Blake. *American Pharmaceutical Association, Journal, (Scientific Ed.)*, v. 46, May 1957, p. 287-290.

Procedure is based upon the differential titration of the acids in dimethyl formamide as solvent with sodium methoxide as titrant.

11140* The Potentiometric Titration of Weak Acids and Bases in Dilute Aqueous Solution. J. C. Gage. *Analyst*, v. 82, Apr. 1957, p. 219-228.

11141* A Method for the Determination of Acetic Anhydride in Mixtures With Acetic Acid. T. Ellerington and J. J. Nicholls. *Analyst*, v. 82, Apr. 1957, p. 233-237.

The acetic anhydride is allowed to react with excess of standard aniline solution in glacial acetic acid, and the excess of aniline is titrated with perchloric acid in acetic acid, with either a potentiometric or a visual end-point.

11142* Flame-Photometric Determination of Magnesium in Plant Material. A Study of the Emission of Magnesium in a Highly Reducing Oxygen-Acetylene Flame. Karin E. Knutson. *Analyst*, v. 82, Apr. 1957, p. 241-254.

11143* The Determination of Thorium and Lanthanons in Monazite. J. Clinch and E. A. Simpson. *Analyst*, v. 82, Apr. 1957, p. 258-269.

Oxalic acid is shown to be an unsatisfactory group precipitant because of solubility losses of the oxalates. Precipitation with ammonium oxalate at a controlled acidity reduces these solubility losses to acceptable levels.

11144* (English.) **Investigation of Chemical Separation Methods for Ca and Sr. Quantitative Determination of Both Elements in Ca-Sr Mixtures by the Isotopic Dilution Method.** G. Leliaert and J. Eeckhaut. *Analytica Chimica Acta*, v. 16, Apr. 1957, p. 311-320.

11145* (English.) **Fluorimetric Determination of Zirconium With Morin.** Richard A. Geiger and E. B. Sandell. *Analytica Chimica Acta*, v. 16, Apr. 1957, p. 346-354.

Zirconium can be determined fluorimetrically with morin in 2*M* hydrochloric acid in the presence of such elements as Al, Be, Ga, Sb, Sn, Th, and U which fluoresce much less strongly under the conditions, by measuring the fluorescence intensity before and after adding ethylene-diaminetetraacetic acid. This substance destroys the fluorescence of Zr only and the difference in fluorescence intensities corresponds to the concentration of Zr in solution.

11146* (English.) **Potentiometric Titrations in Non-Aqueous Solution. I. An Empirical Acidity Potential Scale of Twelve Solvents.** Herman B. van der Heijde and E. A. M. F. Dahmen. **II. Anomalous Behavior of Weak Oxygen Acids in Inert and Weakly Basic Solvents.** Herman B. van der Heijde. *Analytica Chimica Acta*, v. 16, Apr. 1957, p. 378-400.

11147 Sensitive Detector Crayons for Phosgene, Hydrogen Cyanide, Cyanogen Chloride, and Lewisite. Benjamin Witten and Arnold Prostak. *Analytical Chemistry*, v. 29, June 1957, p. 885-887.

Methods of preparation are described for crayons capable of detecting CNCl, CNBr, HCN, phosgene, lewisite, and ethyl dichloroarsine in low concentrations. Semiquantitative detection levels are discussed.

11148 Determination of Traces of Boron in Silicon. George H. Morrison and Richard L. Rupp. *Analytical Chemistry*, v. 29, June 1957, p. 892-895.

Traces of B in Si can be determined in the concentration range of 0.001 to 1 p.p.m. The procedure involves a chemical concentration step employing the use of cation permeable membranes and extraction followed by spectrographic analysis in an atmosphere of argon.

11149 Volumetric Determination of Uranium. Titanous Sulfate as Reductant Before Oxidimetric Titration. James S. Wahlberg, Dwight L. Skinner, and Lewis F. Rader, Jr. *Analytical Chemistry*, v. 29, June 1957, p. 954-957.

Method that uses titanous sulfate as a reductant before oxidimetric titration. Separation of the H_2S group is not necessary. Interfering elements precipitated by cupferron are removed by automatic filtrations made simultaneously rather than by the longer chloroform extraction method.

11150 Thoron-*meso*-Tartaric Acid System for Determination of Thorium. Mary H. Fletcher, F. S. Grimaldi, and Lillie B. Jenkins. *Analytical Chemistry*, v. 29, June 1957, p. 963-967.

In the spectrophotometric determination of Th with thoron, meso-tartaric acid is used as a masking reagent for Zr. The effects of different experimental variables such as the con-

centrations of the reagents, time, and temperature, and the behavior of 35 ions which might be present in Th ores are discussed.

11151 Chromatographic Detection of Mixed Halide Ions in 10^{-10}-Gram Particles. N. H. Farlow. *Analytical Chemistry*, v. 29, June 1957, p. 881-883.

Mixed soluble halides in a single microscopic crystal can be determined by precipitation on a transparent gel film in which colloidal Ag dichromate is dispersed. The limit of detection is of the order of 5×10^{-11} gram of the Na salt.

11152 Versatile Gas-Liquid Partition Chromatography Apparatus. G. K. Ashbury, A. J. Davies, and J. W. Drinkwater. *Analytical Chemistry*, v. 29, June 1957, p. 918-925.

The instrument comprises one recorder unit which is connected as required to one of several column-furnace units maintained in a stand-by condition. Provision is made for rapidly changing columns and column temperature.

11153 Separation and Determination of Neptunium by Liquid-Liquid Extraction. Fletcher L. Moore. *Analytical Chemistry*, v. 29, June 1957, p. 941-944.

A rapid and quantitative radio-chemical method for the determination of Np-237 or Np-239 tracer is based on the liquid-liquid extraction of Np (IV) into 0.5*M* 2-thenoyltrifluoroacetone-xylene to separate NP free from interferences.

11154 Isotopic Method for Determining Oxygen in Chromium. A. D. Kirshenbaum. *Analytical Chemistry*, v. 29, June 1957, p. 980-981.

The isotopic method for determining O in Ti, Zr, Cu, and Fe was extended to the determination of O in Cr with an accuracy of 99% or better.

11155* The Separation of the Compounds of the Lanosterol Group Present in "Isocholesterol" by Chromatography of the *p*-Iodobenzoates-I^{131} and Benzoates. William M. Stokes. *Archives of Biochemistry and Biophysics*, v. 67, Apr. 1957, p. 272-279.

11156* Chromatography of Deoxyribonucleic Acids on Calcium Phosphate Columns. R. K. Main and L. J. Cole. *Archives of Biochemistry and Biophysics*, v. 68, May 1957, p. 186-195.

High mol.-wt. deoxypolynucleotides can be separated from undegraded DNA, under mild conditions of pH and ionic strength, by calcium phosphate column chromatography.

11157* Reports on Microanalytical Determination of Iodine. Al Steyermark. *Association of Official Agricultural Chemists, Journal*, v. 40, May 1957, p. 381-386.

The Carius combustion method was used to determine the iodine in *o*-iodobenzoic acid. Results of the 18 determinations showed considerable variation, and further study of the method is recommended.

11158* Determination of Phosphorus in Fertilizers by Automatic Titration. J. A. Brabson and W. D. Wilhide. *Association of Official Agricultural Chemists, Journal*, v. 40, May 1957, p. 594-606.

Phosphorus can be determined more accurately by automatic titration than by the official volumetric method.

11159* (German.) Gas Chromatography. **Über die Gaschromatographie.** O. Horn, U. Schwenk, and H. Hachenberg. *Brennstoff-Chemie*, v. 38, Apr. 1957, p. 116-120.

An explanation of the underlying principles of gas chromatography and description of an apparatus using carbonic acid as carrier gas. Applications to thermal conductivity cells and preparation of pure gases.

11160* The Chemical Analysis of Cupola Slags. I. The Determination of Alumina. W. E. Clarke. *British Cast Iron Research Association, Journal of Research and Development*, v. 6, Feb. 1957, p. 505-511.

A direct fluoride volumetric method.

11161 Determination of Rare Earths in Steel. H. Krapp. *Henry Brutcher Translation No.* 3864, 11 p. (From *Archiv Eisenhüttenwesen*, v. 27, no. 2, 1956, p. 103-105.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 5818, v. 5, June 1956.

11162 Detection of the Epoxide Group by Infrared Spectroscopy. H. B. Henbest, G. D. Meakins, B. Nicholls, and K. J. Taylor. *Chemical Society, Journal*, Apr. 1957, p. 1459-1462.

For partially alkylated ethylene oxides of moderate mol. wt. a characteristic C-H stretching band can be detected in the 3050-2990 $cm.^{-1}$ region of the infra-red spectrum. Correlations between band position and epoxide structure are discussed.

11163 The C-H Stretching Bands of Methoxyl Groups. H. B. Henbest, G. D. Meakins, B. Nicholls, and A. A. Wagland. *Chemical Society, Journal*, Apr. 1957, p. 1462-1464.

Methoxyl groups in organic compounds can be detected by a characteristic band in the 2832-2815 $cm.^{-1}$ region of the infra-red spectrum.

11164* (German.) A Process for the Microanalysis of AgBr, AgI, and PbI_2. **Verfahren zur Mikroanalyse von AgBr, AgI und PbI_2.** Richard Kuhn and Heinz Schretzmann. *Chemische Berichte*, v. 90, no. 4, 1957, p. 554-556.

Bromine and I in AgBr and AgI were determined by dissolving the Ag halide with KCN and precipitating Ag from the cyanide complex to Zn. The liberated I was quantitatively sublimed in a special apparatus.

11165* (French.) Qualitative Analysis and Determination of Potassium by Means of Sodium Tetraphenylborate. **Recherche qualitative et dosage du potassium par le tétraphénylborate de sodium.** M. Muraire. *Chimie Analytique*, v. 39, May 1957, p. 184-188.

Complex metallic properties of tetraphenylboron. Factors influencing precipitation of potassium tetraphenyl borate. In the case of an alkali medium, the filtration is rapid and easy. Most usual ions are no hindrance. Simple method for K determination.

11166* (Russian.) Silicoorganic Compounds. **Kremniiorganicheskie soedineniia. VIII.** Determination of Carbon and Hydrogen in Silicoorganic Compounds. **Opredelenie ugleroda i vodoroda v kremniiorganicheskikh soedineniiakh.** I. Kerbl' and R. Komers. *Collection of Czechoslovak Chemical Communications*, v. 22, Feb. 1957, p. 222-229.

A simple semi-micro analytic process was developed. A 3.5 cm. layer of the product of decomposition of Ag permanganate was used as a combustion catalyst. A gradual increase in temperature made it possible to analyze the substances having low boiling points.

11167 Nuclear Magnetic Resonance Supplies Fast Answers About Product Composition. A. R. Aikman, R. S. Codrington, and F. F. Kirchner. *Control Engineering*, v. 4, June 1957, p. 105-113.

Sample is subjected simultaneously to a H.F. magnetic field and a d.c. magnetic field so that when nuclear resonance occurs the relation of the r.f. oscillation frequency to the d.c. magnetic field strength uniquely identifies a nuclear species.

11168* (Croatian.) A Modification of Dennstedt's Method for Substances of High Nitrogen Contents. **Prispevek k študiju uporabnosti dennstedtove metode za sežig organskih spojin z visoko vsebnostjo dušika.** M. Perpar, N. Prus, and M. Tišler. *Croatica Chemica Acta*, v. 28, no. 1, 1956, p. 53-56.

A method for determining C and H. The nitrogen oxides are quantitatively reduced in two absorption tubes containing hydroxylammonium phosphate. The absorption tube with reagent is inserted between the water and CO_2 tubes.

11169* (English.) **A New Very Sensitive and Selective Spot Test for Mercury.** I. Kraljić and M. Mate. *Croatica Chemica Acta*, v. 28, no. 4, 1956, p. 273-277.

Test is based on the strong catalytic action of mercuric ions on the decomposition of hexacyanoferrate (II) in the presence of nitrosobenzene.

11170 X-Ray Photometers for Aircraft Generator Brushes. C. K. Jones and S. W. Martin. *Electrical Engineering*, v. 76, June 1957, p. 506-509.

Use of X-rays as a method of nondestructive quantitative chemical analysis. Two instruments designed for the measurement of BaF_2 treatment in aircraft generator brushes.

11171* (German.) Behavior of Low-Oil-Content Paraffins and Oils in Thermal Capillary Analysis. **Das Verhalten ölarmer Paraffine und Öle bei der Thermischen Kapillaranalyse.**

F. J. Lauer. *Fette, Seifen, Anstrichmittel*, v. 59, Mar. 1957, p. 140-142.

The effects of liquid additions to paraffins on the height of ascent on paper strips.

11172 Gas Chromatography. A. I. M. Keulemans. 217 p. 1957. Reinhold Publishing Corp., New York. (QD271 K51g)

Chromatographic methods and apparatus; analytical applications; general theory; the mobile phase in gas-liquid chromatography; the solid support and the stationary liquid; gas-solid chromatography.

11173 Determination of Organic Chlorides and Residues From Chlorinated Pesticides by Combustion Analysis. J. A. Hudy and C. L. Dunn. *Journal of Agricultural and Food Chemistry*, v. 5, May 1957, p. 351-354.

Vertical, quartz-packed furnace features the ability to burn liquid organic materials continuously at rates of 10 to 20 g. per hr. The chloride resulting from combustion is determined by amperometric titration with $AgNO_3$ after absorption in alkaline solution.

11174 Determination of Zinc in Plants and Soils. E. T. Verdier, W. J. A. Steyn, and D. J. Eve. *Journal of Agricultural and Food Chemistry*, v. 5, May 1957, p. 354-360.

Determinations by the dithizone and polarographic methods.

11175 The Removal of Plutonium Before the Analysis of Mixed Fission Products. G. Phillips and E. N. Jenkins. *Journal of Inorganic and Nuclear Chemistry*, v. 4, no. 3-4, 1957, p. 220-224.

Methods for the complete removal of up to 100 mg. of Pu.

11176* Infrared Spectra of Polychlorobenzenes. Earle K. Plyler, Harry C. Allen, Jr., and E. D. Tidwell. *Journal of Research, National Bureau of Standards*, v. 58, May 1957, p. 255-263.

Spectra of benzene, monofluorobenzen, monobrombenzene, monoiodobenzene, and 12 chlorinated benzenes were measured in the range from 2 to 38 μ.

11177* An Ion-Exchange Method of Estimating Carbonate in the Presence of Uranium & Vanadium. A. K. Sundaram, M. Sundaresan, and D. G. Vartak. *Journal of Scientific and Industrial Research*, v. 16B, Jan. 1957, p. 25-27.

Using Amberlite IRA-400, amounts as small as 20 mg. of Na_2CO_3 in the presence of 8 mg. of U and 10 mg. of V can be estimated within an error of 2%.

11178* An Improved Method for the Simultaneous Determination of Aluminium, Copper & Magnesium in Zinc Alloys by Spectrographic Method. B. C. Kar, M. K. Gupta, and V. Muthukrishnan. *Journal of Scientific & Industrial Research*, v. 16B, Jan. 1957, p. 27-31.

Method employs the porous cup-spark technique and the plate calibration method. Gives accuracy within 3%.

11179* Iodometric Determination of Iodate, Bromate & Dichromate in the Presence of Copper. R. V. V. Satyanarayanamurthy and M. N. Sastry. *Journal of Scientific & Industrial Research*, v. 16B, Feb .1957, p. 83-85.

Interference of Cu is eliminated using disodium salt of ethylene diamine tetra-acetic acid as the complexing agent for Cu.

11180 An Improved Automatic Fraction Collector. G. F. H. Box and R. B. Bradbury. *Journal of Scientific Instruments*, v. 34, May 1957, p. 183-184.

Fraction collector for chromatography incorporates a new type of liquid dispenser, photo-electrically operated, and capable of delivering predetermined, fixed volumes despite variations in rate of outflow from columns, and changes in density of the liquid.

11181* (French.) Sampling for the Determination of Hydrogen Content of Liquid Steel and Pig Iron. **Prélèvements des éprouvettes pour le dosage de l'hydrogène dans les aciers et les fontes.** Erich Piper and Heinrich Hagedorn. *Métallurgie et la Construction Mécanique*, v. 89, Apr. 1957, p. 329 + 3 pages.

Description of test sample and method adopted for detecting and measuring H. Comparision of three methods of taking samples.

11182 Gravimetric Determination of Barium in Zirconium Metal and in Certain Zirconium Salts. Louis Silverman and Katherine Trego. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-1720, Apr. 1957, 17 p. (UF767 Un3.1na Contin.)

Barium may be determined gravimetrically in quantities ranging from 0.2 to 2.0 mg. in hydrated $ZrOCl_2$ and in Zr metal after complete separation of the Zr.

11183 Determination of Uranium Dioxide in Stainless Steels by the X-Ray Fluorescence Method. Louis Silverman, William W. Houk, and Lavada A. Moudy. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-1848, Apr. 1957, 11 p. (UF767 Un3.1na Contin.)

Sample is dissolved in perchloric acid and an internal standard of $Sr(NO_3)_2$ is added.

11184 Volumetric Determination of Phthalic Anhydride in Alkyd Resins. A. Brink. *Oil & Colour Chemists' Association, Journal*, v. 40, May 1957, p. 361-364.

Method depends on the saponification of the resin with alcoholic KOH, the addition of a known excess of standard acid, extraction of the liberated fatty acids with CCl_4 and titration of the aqueous solution with standard alkali.

11185 Spectrographic Procedure for Analysis of Powdered Samples of Unknown Origin. H. E. Biber and S. Levy. *Optical Society of America, Journal*, v. 47, May 1957, p. 381-385.

A simplified version of the dilution method permits the determination of the relative amounts of the different elements in very small samples.

11186* (English.) **Studies on Tall Oil Rosin. I. Analytical Methods, an Analysis of Tall Oil Rosin.** Paavo Kajanne and Erkki Honkanen. *Paperi ja Puu*, v. 39, no. 4A, Apr. 1957, p. 171-177.

Proposes a method for the simultaneous spectrophotometrical analysis of mixtures of abietic and dehydroabietic acids. Mild hydrogenation is needed to eliminate the background interference.

11187 Apparatus for Remote Volumetric Titrimetry. Fred W. Dykes, Richard G. Masterson, and James E. Resin. *Phillips Petroleum Co., Idaho Operations Office (U. S. Atomic Energy Commission)*, IDO-14406, Apr. 1957, 21 p. (UF767 UnA.1id Contin.)

Typical applications; reliability data.

11188 The Polarographic Analysis of Tin and Tin Alloy Plating Solutions. A. E. Knotowicz and J. V. Petrocelli. *Plating*, v. 44, June 1957, p. 602-606.

Method for the polarographic analysis of Sn and the elements commonly alloyed with Sn in plating solutions, eliminating a digestion with acid where possible.

11189* (Polish.) Analysis of Some Magnesium and Copper Casting Alloys With the Aid of Instrumental Methods. **Analiza niektorych odlewniczych stopów magnezu i miedzi metodami instrumentalnymi.** Zofia Seweryn and Zygmunt Dolinski. *Prace Instytutu Odlewnictwa*, v. 5, no. 2/55, 1956, p. 66-79.

Polarographic method of determining Zn and Cu in Mg alloys. Potentiometric titration method for Zn and Al in Mg alloys, and for Zn, Pb, and Mn in Cu alloys.

11190* Acid Anilides. V. Qualitative Separation of Fatty Acid Anilides by Paper Chromatography. VI. Quantitative Paper Chromatographic Analysis of Fatty Acid Anilides. A. P. De Jonge and A. Verhage. *Recueil des Travaux Chimiques des Pays-Bas*, v. 76, Mar. 1957, p. 221-248.

11191* (English.) **Quantitative Determination of Antioxidants, After a Chromatographic Separation on Completely Acetylated Filter Paper. I. Determination of Phenyl-l-Naphthylamine and of Phenyl-2-Naphthylamine. II. Determination of Some *P*-Phenylenediamine Derivatives.** J. W. H. Zijp. *Recueil des Travaux Chimiques des Pays-Bas*, v. 76, Apr. 1957, p. 313-320.

11192* (English.) **Polarographic Determination of Tin and Antimony in Iron and Steel.** Hidehiro Gotô, Shigerô Ikeda, and Shirô Watanabe. *Science Reports of the Research Institutes, Tôhoku University*, ser. A, v. 9, Apr. 1957, p. 97-106.

Procedure for determination of 0.02 to 0.1% Sn and 0.005 to 0.1% Sb.

11193* (English.) **Determination of Microamounts of Calcium, Magnesium and Aluminium in Titanium Metal.** Hidehiro Gotô and Shurô Takeyama. *Science Reports of the Research Institutes, Tôhoku University*, ser. A, v. 9, Apr. 1957, p. 138-146.

Titanium is removed by extracting titanous thiocyanate with ether.

11194 Technique of Organic Chemistry. v. X. Fundamentals of Chromatography. Harold Gomes Cassidy. 447 p. 1957. Interscience Publishers, New York. (QD271 C27f)

Molecular interactions; theory; absorbents; fractionation procedures; gas-liquid partition, column, and paper partition methods.

11195* (English.) **Investigation Into the Determination of Substances in Minute Quantity. XIII. Quantitative Determination of a Small Amount of Mercury in the Presence of Large Amount of Chloride Ion and an Equilibrium of "Enolized" Dithizone-Mercury (II) Compound.** Takio Kato, Shinsuke Takei, and Akio Okagami. *Technology Reports, Tôhoku University*, v. 21, no. 2, 1957, p. 291-305.

11196* (English.) **Syntheses of Derivatives of Dithizone and Their Application to Analytical Chemistry. I. On p, p′-Dimethyldithizone.** Shinsuke Takei, Kuniko Shibuya, and Takio Kato. **II. On O,O′-Dimethyldithizone and Its Application to the Determination of Mercury and Copper.** Shinsuke Takei and Takio Kato. *Technology Reports, Tôhoku University*, v. 21, no. 2, 1957, p. 307-333.

11197 Eddy Current Electrical Conductivity Measurement as an Analysis for Molybdenum in Binary Molybdenum-Uranium Alloys. R. E. Cofield. *Union Carbide Nuclear Company (U. S. Atomic Energy Commission)*, Y-1152, Feb. 1957, 32 p. (UF767 Un3.1y Contin.)

11198* (Russian.) Amperometric Determination of Microgram Amounts of Zinc and Copper. **Amperometricheskoe opredelenie mikrogrammovykh kolichestv tsinka i medi.** A. P. Voiloshnikova, M. T. Kozlovskii, and O. A. Songina. *Zavodskaia Laboratoriia*, v. 23, Mar. 1957, p. 273-276.

The anodic amperometric ferrocyanide process can be applied to the determination of microgram amounts of Zn in the presence of a large quantity of salts of Fe, Al, Co, Mn and alkali metals, and of Cu in the presence of a very large quantity of salts of other metals.

11199* (Russian.) Concentration of Beryllium in Analysis of Beryllium Ores. **Kontsentrirovanie berilliia pri analize berillievykh rud.** B. S. Tsyvina and N. K. Davidovich. *Zavodskaia Laboratoriia*, v. 23, Mar. 1957, p. 280-282.

Beryllium phosphate was precipitated by means of titanium phosphate in the presence of Triton B. Beryllium was determined after its precipitation by means of Ti from an imitation mixture. (4 mg. Ti in the presence of 10 ml. 15% Triton B solution).

11200* (Russian.) Application of Radioactive Isotopes in Quantitative Analysis. **Primenenie radioaktivnykh izotopov v kolichestvennom analize.** A. K. Lavrukhina. *Zavodskaia Laboratoriia*, v. 23, Mar. 1957, p. 296-303.

11201 (English.) **Electro-Migration on Paper in the Separation of Ions. III.** Hari Gopal Mukerjee. *Zeitschrift für Analytische Chemie*, v. 155, Mar. 1957, p. 406-411.

A study of the migration sequences of Ag and Hg ions, their separation from each other and from such ions as Pb, Cu, Bi, Cd, Co, and Ni, in different electrolytes.

11202* (English.) **Studies on Paper Chromatography. II. Rhythmicity on Impregnated Filter Papers.** A. C. Chatterji and Hari Bhagwan. *Zeitschrift für Analytische Chemie*, v. 156, no. 1, 1957, p. 7-15.

Lead nitrate and KI impregnated strips of filter paper, with and without colloids as the fixing agents were used to study the precipitation phenomenon.

11203* (German.) Using "Komplexon" in Ore Analysis. **Über die Verwendung von "Komplexon" in der Erzanalyse.** Heinz Gundlach. *Zeitschrift für Erzbergbau un Metallhüttenwesen*, v. 10, Apr. 1957, p. 177-182.

Describes a method using "Komplexon" (disodium ethylenediaminetetraacetate) that proved satisfactory for determination of CaO and MgO in ores and rocks, Zn and Pb in zincblende and PbS, and the chief constituents of Cu ores.

See also: **10978** (determination of insecticide residues on crops); **11020** (determination of cholesterol); **11045** (biochemical analysis); **11254** (colorimetric determination of diacetylmethylcarbinol); **11361** (I.R. spectra of methylthiazoles); **11679** (analysis of fats); **11698** (analysis of feldspar); **11754** (furnace atmosphere analyzer); **11757** (analysis instruments); **11778** (differential analysis of grease); **12120** (assay of radioactive materials); **12351** (analysis of sewage); **12379** (identification of textile finishes); **12386** (estimation of tannin); **12387** (analysis of naphthenic systems); **12395** (analysis of pulping liquor).

CHEMISTRY—INORGANIC AND GENERAL

11204 Dimorphic Modifications of Beryllium Diiodide, BeI_2. Rowland E. Johnson, E. Staritzky, and R. M. Douglass. *American Chemical Society, Journal*, v. 79, May 5, 1957, p. 2037-2039.

Two polymorphic modifications were found, one being a heretofore undescribed high-temperature phase stable above 350 C.

11205 The Reaction of Silylamines With Boron Trifluoride. Methyl- and Silylaminoboron Difluorides. Sei Sujishi and Samuel Witz. *American Chemical Society, Journal*, v. 79, May 20, 1957, p. 2447-2450.

Reaction products of N-Silyldimethylamine, N-methyldisilylamine, and trisilylamine.

11206 Inorganic Chemistry in Trifluoracetic Acid. George S. Fujioka and George H. Cady. *American Chemical Society, Journal*, v. 79, May 20, 1957, p. 2451-2454.

The effects of anhydrous HCl, H_2S, $HClO_4$ H_2SO_4, SO_3, H_3PO_4, HPO_3, Cl_2, CrO_3, $KMnO_4$, and SO_2 upon 25 dissolved trifluoroacetates of metals were studied.

11207 Inorganic Complex Compounds Containing Polydentate Groups. XII. Cobalt(II) Complexes of Tetraethylenepentamine. Hans B. Jonassen and Fred W. Frey. *American Chemical Society, Journal*, v. 79, May 20, 1957, p. 2454-2455.

Data indicate that all five amino groups of tetraethylenepentamine coordinate.

11208* (French.) A Contribution to the Study of Ethyl Oxide, a Reaction Medium, in Mineral Chemistry. **Contribution a l'étude de l'éther oxyde d'éthyle, milieu réactionnel, en chimie minérale.** G. Monnier. *Annales de Chemie (Paris)*, v. 2, Jan.-Feb. 1957, p. 14-57.

A study of anhydrous ether, $(C_2H_5)_2O$, as a reaction medium, and of the reactions of metallic halides, hydrides, nitrides, perchlorates, and nitrates. Solubility of mineral salts.

11209* (Russian.) Mechanism of Zirconium and Titanium Oxide Reduction by Calcium Hydride. **O mekhanizme vosstanovleniia okislov tsirkoniia i titana gidridom kal'tsiia.** G. A. Meerson and O. P. Kolchin. *Atomnaia Energiia*, v. 2, Mar. 1957, p. 253-259.

11210 The Thermal Decomposition of Nitrous Oxide. The Effect of Foreign Molecules. T. N. Bell, P. L. Robinson, and A. B. Trenwith. *Chemical Society, Journal*, Apr. 1957, p. 1474-1480.

The kinetics of the decomposition of N_2O in the presence of CO_2, CF_4, and the inert gases were studied over the temperature range 650 to 750 C and with pressures of N_2O of 50 to 100 mm., and compared with results obtained with SO_2.

11211 Addition Compounds of Gallium Trichloride. II. Gallium Trichloride-Phosphorus Oxychloride. N. N. Greenwood and K. Wade. *Chemical Society, Journal*, Apr. 1957, p. 1516-1524.

The melting-point diagram of the system gallium trichloride-phosphorus oxychloride shows the presence of a new compound, $GaCl_3 \cdot POCl_3$, m.p. 118.5 C, and the possible formation of a second compound $GaCl_3 \cdot 2POCl_3$ melting incongruently at about 77 C. The 1:1 compound has a vapor pressure of <1 mm. at the melting point and can be sublimed *in vacuo* without decomposition.

11212 The Chemistry of Nitrosyl Complexes. III. Evidence for Compound Formation in Liquid Nitrosyl Chloride From Tracer Studies. J. Lewis and D. B. Sowerby. *Chemical Society, Journal*, Apr. 1957, p. 1617-1622.

The rapid exchange of ^{36}Cl between the nitrosyl chloride addition compounds of $FeCl_3$ and $SbCl_5$ with liquid nitrosyl chloride is in agreement with the formulation of these compounds as nitrosonium salts. With the more covalent chlorides, $AsCl_3$, $POCl_3$, and CCl_4, exchange is rapid with $AsCl_3$ but very slow with $POCl_3$ and CCl_4.

11213 Studies in the Chemistry of Quadrivalent Germanium. IV. The Chemical Nature of Solutions of Quadrivalent Germanium in Hydrochloric or Hydrobromic Acid. D. A. Everest and J. C. Harrison. *Chemical Society, Journal*, Apr. 1957, p. 1820-1823.

11214* (German.) Silver Iodide Complexes of Ammonium Iodides and Their Use in Making Schiff Bases. **Silberjodid-Komplexe von Ammoniumjodiden und Ihre Verwendung zur Darstellung von Schiffschen Basen.** Richard Kuhn and Heinz Schretzmann. *Chemische Berichte*, v. 90, no. 4, 1957, p. 557-564.

Description of six AgI complexes forming white needles. The AgI compounds obtained from primary and secondary amines react at temperatures as low as −20 C with acetone. Quantitative production of Schiff bases.

11215 The Chemistry of Borates.. Peter H. Kemp. Pt. I. 88 p. 1956. Borax Consolidated, London. (QD181.B1 C42)

Review of properties and reactions. Includes oxides, boric acid, and perborates.

11216 Extraction of Thorium Nitrate From Nitric Acid by TBP-"Ultrasene". Thomas H. Siddall. *E. I. du Pont de Nemours & Co., Savannah River Laboratory Technical Division (U. S. Atomic Energy Commission)*, DP-181, Oct. 1956, 22 p. (UF767 Un3.1dp Contin.)

Equilibrium data for the distribution of $Th(NO_3)_4$ and HNO_3 between aqueous solutions and tri-n-butyl phosphate diluted with kerosene.

11217 Viscosity of Aqueous Solutions of Sulphuric Acid. O. P. Kharbanda. *Industrial Chemist*, v. 33, May 1957, p. 224-225.

Nomogram relating the variation of viscosity of sulphuric acid with concentration and temperature between 0 and 300 F.

11218 (German.) Metal Carbonyls. **Über Metallcarbonyle. LXXVI.** Ruthenium Carbonyl Iodides. **Zur Kenntnis des Ruthenium Carbonyljodids.** W. Hieber and H. Heusinger. *Journal of Inorganic and Nuclear Chemistry*, v. 4, no. 3-4, 1957, p. 179-184.

Conditions under which $Ru(CO)_2I_2$ will react with complex-forming ligands (X) having a free electron pair, forming with certain *N*-bases, non-electrolyte compounds of the $RuX_2(CO)_2I_2$ type.

11219 Factors Affecting the Solution of Inorganic Salts in Organic Solvents. Leonard I. Katzin. *Journal of Inorganic and Nuclear Chemistry*, v. 4, no. 3-4, 1957, p. 187-204.

Inorganic salts are appreciably soluble in organic media, principally of the oxygenated forms (alcohols, ketones, ethers, esters), when they are capable of forming neutral molecules in solution. This property is largely confined to the transition elements.

11220 The Particle Size of Some Uranium Dioxide Samples. F. D. Leipziger. *Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission)*, KAPL-1743, Mar. 1957, 18 p. (UF767 Un3.1ka Contin.)

Surface area measurements by the BET nitrogen adsorption method was made on four different UO_2 samples. The particle size of the UO_2 was calculated from these measurements and compared with particle size measurements determined by studying X-ray line broadening and settling velocity, and measurements by electron microscopy.

11221* Mechanisms of Substitution Reactions of Coordination Compounds. Fred Basolo. *Record of Chemical Progress*, v. 18, no. 1, 1957, p. 1-10.

Some recent observations pertaining to reactions of Co(III) and Pt(II) complexes.

11222* The Chemistry and Crystallography of Polonium. K. W. Bagnall and R. W. M. D'Eye. *Royal Institute of Chemistry, Journal*, v. 81, Apr. 1957, p. 270-275.

11223 The Complexing of Cerium (III), Lanthanum (III) and Gadolinium (III) by Fluoride Ions in Aqueous Solution. J. W. Kury, Z. Z. Hugus, Jr., and W. M. Latimer. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-3678, Jan. 1957, 11 p. (UF767 U3u Contin.)

Equilibrium quotients for the formation of CeF^{+2}, LeF^{+2}, and GdF^{+2} in aqueous solution were determined at an ionic strength of 0.50 and a temperature of 25 C by means of the "ferri" method.

11224* (English.) **On the Standardization of Permanganate by Arsenious Oxide.** Rameshwar Prasad and Arun K. Dey. *Zeitschrift für Analytische Chemie*, v. 155, Mar. 1957, p. 420-423.

Aqueous iodine, KI, and KIO_3 act as catalysts. Titration is carried out in an excess of HCl.

See also: **10986** (surface properties of phosphates); **11270** (reactions of Hg salts with propylene); **11273** (Mg-organic compounds); **11742** (chemical-literature searching); **12294** (chemical constants).

CHEMISTRY—ORGANIC

11225 The Properties of Tetraethylammonium and Tetra-*n*-Butylammonium Picrates in Anisole-Nitrobenzene Solutions. Arnet L. Powell and Arthur E. Martell. *American Chemical Society, Journal*, v. 79, May 5, 1957, p. 2118-2123.

11226 Vinyl Derivatives of the Metals. II. The Cleavage of Vinyltin Compounds by the Halogens and by Protonic Acids. Dietmar Seyferth. *American Chemical Society, Journal*, v. 79, May 5, 1957, p. 2133-2136.

Product studies of cleavage reactions of compounds of the type $R_2SN(CH{=}CH_2)_2$ show that the vinyl group is cleaved more readily than normal alkyl groups but less readily than the phenyl group. Phenyldivinyltin halides undergo thermal redistribution, yielding trivinyltin halide and triphenyltin halide.

11227 The Kinetics of the Hydrolysis of Acetylenic Chlorides and Their Reactions With Primary and Secondary Aliphatic Amines. G. F. Hennion and Kenneth W. Nelson. *American Chemical Society, Journal*, v. 79, May 5, 1957, p. 2142-2145.

Acetylenic chlorides undergo very slow solvolysis in 80% ethanol at 25 C. The rate is accelerated by addition of NaOH and the reactions then commonly follow second-order kinetics.

11228 The Kinetics of the Saponification of Acetylenic Carbinol Esters and Related Compounds. G. F. Hennion and S. Olivia Barrett. *American Chemical Society, Journal*, v. 79, May 5, 1957, p. 2148-2150.

Acetylenic carbinol esters undergo extremely slow solvolysis in mixed aqueous solvents, as do the chlorides, and rapid saponification in the presence of base.

11229 A Kinetic Study of the Leuchs Anhydrides in Aqueous Solution. I-II. Paul D. Bartlett, Richard H. Jones, and Donald C. Dittmer. *American Chemical Society, Journal*, v. 79, May 5, 1957, p. 2153-2159.

The reactions of anhydro-N-carboxyglycine, anhydro-N-carboxy-d- and L-alanine and anhydro-N-carboxy-α aminoisobutyric acid with water and some amino acids were followed kinetically by CO_2 evolution.

11230 Alkaloids of the Amaryllidaceae. X. The Structure of Caranine. E. W. Warnhoff and W. C. Wildman. *American Chemical Society, Journal*, v. 79, May 5, 1957, p. 2192-2198.

11231 The Preparation of Some Merimine Derivatives. William B. Wright, Jr., John S. Webb, and James M. Smith, Jr. *American Chemical Society, Journal*, v. 79, May 5, 1957, p. 2199-2203.

Preparation and properties of a number of derivatives of 6-methylmerimine.

11232 Quaternary Piperazines With Anti-Pinworm Activity. M. Harfenist. *American Chemical Society, Journal*, v. 79, May 5, 1957, p. 2211-2215.

Syntheses and properties of 100 piperazine monoquaternary salts. Anthelmintic activity is discussed briefly as a function of structure.

11233 Some New *o*-Phenylenediamines and the Related Benzimidazoles, Benzotriazoles and Quinoxalines. H. B. Gillespie, Morris Engelman, Francis Spano, and Samuel Graff. *American Chemical Society, Journal*, v. 79, May 5, 1957, p. 2245-2248.

Synthesis of 3,4-diamino-5-nitrophenetole and 3,4-diamino-2-nitroanisole, and their use in preparing related benzimidazoles, benzotriazoles, and quinoxalines.

11234 A Synthesis of Radioactive Methylhistidines. Robert W. Cowgill. *American Chemical Society, Journal*, v. 79, May 5, 1957, p. 2249-2251.

The methyl ester of phthaloyl-L-histidine was synthesized, methylated with $C^{14}H_3I$, and then acid hydrolysis was employed to remove the phthaloyl and ester groups. Products separated by ion-exchange chromatography included 1-$C^{14}H_3$-L-histidine, 3-$C^{14}H_3$ histidine, 1,3-$(C^{14}H_3)_2$-L-histidine chloride, and histidine.

11235 2-Pyrones. XXVI. Alkylidene Methylglutaconic Acids and 3,6-Dialkyl-5-Carboxy-5,6-Dihydro-2-Pyrones From Methyl β-Methylglutaconate and Ethyl Isodehydroacetate and Their Isomerization and Decarboxylation. Richard H. Wiley and H. G. Ellert. *American Chemical Society, Journal*, v. 79, May 5, 1957, p. 2266-2271.

11236 Synthesis of Acids Containing Hydrophenanthrene and Hydroacephenanthrylene Rings. D. L. Turner. *American Chemical Society, Journal*, v. 79, May 5, 1957, p. 2271-2275.

The Reformatsky reaction with methyl 3-carbomethoxy-2-keto-3-methyl-6-phenylcyclohexane-1-acetate yields an unsaturated acid which can be cyclized either to a ketoanhydride or to an acephenanthrylene phenol.

11237 Cyanine Dyes. I. Absorption of Cyanines Derived From Pyranothiazole and Thiopyranothiazoles. Robert H. Sprague. *American Chemical Society, Journal*, v. 79, May 5, 1957, p. 2275-2281.

Three new thiazole bases were prepared by condensing thioacetamide with 3-bromotetrahydro-4-pyrone, 3-bromotetrahydro-1-thio-4-pyrone and 2-bromotetrahydro-1-thio-3-pyrone. Quaternary salts of the products have given rise to new cyanine dyes, some of which are powerful photographic sensitizers.

11238 Derivatives of 4-Amino-2-Hydroxybenzoic Acid. IV. Amides. R. O. Clinton, S. C. Laskowski, U. J. Salvador, Helen G. Bates, and Patricia M. Carroll. **V. Basic Ethers.** R. O. Clinton, S. C. Laskowski, U. J. Salvador, and Patricia M. Carroll. *American Chemical Society, Journal*, v. 79, May 5, 1957, p. 2285-2295.

Preparation and properties.

11239 Light-Catalyzed Organic Reactions. VI. The Isomerization of Some Dienones. G. Büchi and N. C. Yang. *American Chemical Society, Journal*, v. 79, May 5, 1957, p. 2318-2323.

β-Ionone yielded pyran and spiroketone containing a cyclopropane ring. Irradiation of both pseudoionone and 6-methyl-3,5-heptadiene-2-one led to polymer formation. *trans-trans*-Crotonylideneacetone was converted to the $\Delta^{2,4}$-*cis* isomer.

11240 The Rearrangement of α,β-Epoxy Ketones. VI. 1,1-Disubstituted Ethylene Oxides. Herbert O. House, Donald J. Reif, and Richard L. Wasson. *American Chemical Society Journal*, v. 79, May 20, 1957, p. 2490-2495.

α,β-Epoxy-α-phenylpropiophenone, α,β-epoxy-α-ethylpropiophenone, and 1,2-dimesityl-2,3-epoxy-1-propanone were isomerized with boron trifluoride.

11241 A New Synthesis of α-Nitroesters. Nathan Kornblum, Robert K. Blackwood, and Jack W. Powers. *American Chemical Society, Journal*, v. 79, May 20, 1957, p. 2507-2509.

Treating α-haloesters with sodium nitrite in the presence of phloroglucinol gave yields of 66 to 91%.

11242 *aci*-Nitroalkanes. II. The Mechanism of the Nef Reaction. M. Frederick Hawthorne. **III. The Solvolysis of α-Chloronitrosocycloalkanes in the Presence of Electrophilic Silver Ion.** M. Frederick Hawthorne and R. Donald Strahm. *American Chemical Society, Journal*, v. 79, May 20, 1957, p. 2510-2517.

11243 The Base-Catalyzed Self-Condensation of 2-Ethyl-2-Hexenal. I. Formation of a Cyclic Aldol, $C_{16}H_{30}O_2$. II. Formation of a Glycol, $C_{16}H_{30}O_2$, and a Lactone, $C_{16}H_{30}O_3$. Arnold T. Nielsen. *American Chemical Society, Journal*, v. 79, May 20, 1957, p. 2518-2530.

11244 Thermal Syntheses of Telomers of Fluorinated Olefins. I. Perfluoropropene. Murray Hauptschein, Milton Braid, and Francis E. Lawlor. *American Chemical Society, Journal*, v. 79, May 20, 1957, p. 2549-2553.

Step-wise synthesis of polymers up to molecular weights of 2500 are detailed.

11245 7-Azaindole. IV. The Hydrogenation of 7-Azaindole and Related Compounds. Michael M. Robison, Florence P. Butler, and Bonnie L. Robison. *American Chemical Society, Journal*, v. 79, May 20, 1957, p. 2573-2578.

11246 3,4-Di-*O*-Methyl-D-Galactosamine Hydrochloride (2-Amino-2-Deoxy-3,4-di-*O*-Methyl-D-Galactose Hydrochloride). Roger W. Jeanloz, Dieter M. Schmid, and Pierre J. Stoffyn. *American Chemical Society, Journal*, v. 79, May 20, 1957, p. 2586-2590.

The synthesis of this reference substance for structural studies of galactosamine-containing substances is described.

11247 Phosphonic Acids. IV. Preparation and Reactions of β-Ketophosphonate and Enol Phosphate Esters. Herbert I. Jacobson, Martin J. Griffin, Seymour Preis, and Elwood V. Jensen. **V. An Improved Method for the Preparation of Sodium Diethyl Phosphonate and a Study of its Comparative Reactivity With Alkyl Halides and *p*-Toluenesulfonates.** Ronald G. Harvey, Terrell C. Myers, Herbert I. Jacobson, and Elwood V. Jensen. *American Chemical Society, Journal*, v. 79, May 20, 1957, p. 2608-2615.

α-Iodoketones react "normally" with triethyl phosphite but α-chlorinated ketones react to form enol phosphate esters.

11248 1,4-Addition of Grignard Reagents to 9-Phenanthryl Ketones. Reynold C. Fuson and Stanley J. Strycker. *American Chemical Society, Journal*, v. 79, May 20, 1957, p. 2633-2636.

11249 Report of the Literature Review Committee. 23rd Annual Review of the Literature on Fats, Oils, and Detergents. M. M. Piskur. *American Oil Chemists' Society, Journal*, v. 34, May 1957, p. 222-239.

Economic information and comprehensive literature; production processes; products (excepting detergents); deterioration of fatty materials.

11250 Physical Properties of Aceto- and Butyro-Oleins, Mono-Olein, and Diolein. Audrey T. Gros and R. O. Feuge. *American Oil Chemists' Society, Journal*, v. 34, May 1957, p. 239-244.

11251 Interaction of Beta Particles With Organic Compounds. Doris Clegg Müller. *Analytical Chemistry*, v. 29, June 1957, p. 975-978.

The general principles which govern the backscattering of β particles from atoms and molecules are applied to some representative organic compounds. The anomaly of H is resolved and a reliable value is fixed for it. The behavior of isomers is described and proof is given that the backscattering of compounds is accurately predictable from the intrinsic scattering of the constituent atoms.

11252* (German.) Modes of Formation and Reactions of Dihydrobenzene (Cyclohexadiene). **Bildungsweisen und Reaktionen von Dehydrobenzol (Cyclohexadienin).** G. Wittig. *Angewandte Chemie*, v. 69, Apr. 21, 1957, p. 245-251.

Discusses the modes of formation of this new type of compound and describes its dienophilic properties.

11253* (French.) Investigations on the Diacetylenic Conjugated Symmetric ε-Glycols. **Recherches sur les ε-glycols diacétyléniques conjugués symétriques.** Léon Audier. *Annales de Chimie (Paris)*, v. 2, Jan.-Feb. 1957, p. 105-137.

Reactions, including hydration, dehydration, and hydrogenation. Infra-red spectra; structural and analytical data.

11254* Preparation, Properties, and Colorimetric Determination of Diacetylmethylcarbinol. Elliot Juni and Gloria H. Heym. *Archives of Biochemistry and Biophysics*, v. 67, Apr. 1957, p. 410-422.

11255* (French.) A Contribution to the Study of Esters of Orthophosphoric Acid. **Contribution à l'étude des esters de l'acide orthophosphorique.** P. Chabrier and A. Carayon-Gentil. *Bulletin de la Société Chimique de France*, no. 5, May 1957, p. 639-643.

Description of new β-halogenated triesters of phenyl and diphenyl orthophosphoric acids. Study of their hydrolysis and of some reactions affecting the halogen atom.

11256* (French.) The Thiophene Analogs of Diaryl-3,3 Phtalides. **Sur les analogues thiophéniques des diaryl-3,3 phtalides.** N. P. Buu-Hoi, N. D. Xuong, and N. H. Nam. *Bulletin de la Société Chimique de France*, no. 5, May 1957, p. 679-680.

Synthesis and properties of analogs are described after preparation by condensation of the chloride of the ortho-(thenoyl-2) benzoic acid with phenols or by reaction of the chlorides of the orotho-(thenoyl-2) benzoic and ortho-aroylbenzoic acids with thiophene.

11257* (French.) Chlorination of Polysubstituted Monophenols. **Sur la chloruration de monophénols polysubstitués. I.** Pentachlorophenol: Preparation of Hexachloro-1,2,4,4,5,6 Cyclohexadiene-1,5 one-3. **Pentachlorophénol: préparation de l'hexachloro-1,2,4,4,5,6 cyclohexadiène-1,5 one-3.** Léon Denivelle and Roland Fort. *Bulletin de la Société Chimique de France*, no. 5, May 1957, p. 724-728.

The action of Cl, in a non-polar solvent medium, on pentachlorophenol in the presence of hydracid stabilizers and on finely dispersed metallic pentachlorphenates, leads to hexachloro-1,2,4,4,5,6 cyclohexadiene-1,5 one-3, formed by the action of alkyl hydrochlorites on pentachlorophenol.

11258 A Note on Ureido Derivatives Isolated as By-Products in Amino Acid Synthesis. P. D. Burland and J. D. Christian. *Canadian Journal of Chemistry*, v. 35, May 1957, p. 444-448.

Approximately 10 to 20% yields of α-ureido propionamide and α-ureido isovaleramide were obtained as major by-products in the synthesis of 5-methyl hydantoin and 5-isopropyl hydantoin, respectively, by the Gaudry technique.

11259 Steroids. XII. Some Examples of the Favorski Reaction. D. E. Evans, A. C. DePaulet, C. W. Shoppee, and F. Winternitz. *Chemical Society, Journal*, Apr. 1957, p. 1451-1458.

2 α-Bromocholestan-3-one undergoes the Favorski reaction to give methyl A-norcholestane-2 α-carboxylate accompanied by methyl A-norchloestane-3 α-carboxylate, whose structures are proved by Wieland-Barbier degradation.

11260 Studies on Phosphorylation. XV. The Use of Phosphoramidic Esters in Acylation. A New Preparation of Adenosine-5' Pyrophosphate and Adenosine-5' Triphosphate. V. M. Clark, G. W. Kirby, and Alexander Todd. *Chemical Society, Journal*, Apr. 1957, p. 1497-1501.

11261 Oxidation of Organic Sulphides. XIII. Autoxidation of Thiacyclohexane, 2-Ethyl-2-Methyl-5-*iso*propylthiacyclopentane, and Thiacyclohex-3-ene. L. Bateman, J. I. Cunneen, and J. Ford. *Chemical Society, Journal*, Apr. 1957, p. 1539-1544.

11262 Quantitative Aspects of the Base-Catalysed Halogenation of Aliphatic Ketones. II. Iodination of Non-Methyl Ketones. C. F. Cullis and M. H. Hashmi. *Chemical Society, Journal*, Apr. 1957, p. 1548-1553.

Base-catalyzed iodination of diethyl ketone, di*iso*propyl ketone, and *n*-butyl ethyl ketone were studied. The halogen effects considerable oxidation, and only a small proportion of the consumed iodine is converted into organic form.

11263 Lipids. V. Total Synthesis of Ximenynic Acid, Homoricinstearolic Acid, and Two Fatty Hydroxy-Acids With Allenic Side-Branches. VI. Total Synthesis of α- and β-Eleostearic and Punicic (Trichosanic) Acid. L. Crombie and A. G. Jacklin. *Chemical Society, Journal*, Apr. 1957, p. 1622-1646.

11264 The Reaction of Chlorobenzene With Methyl Radicals. A. L. J. Beckwith and William A. Waters. *Chemical Society, Journal*, Apr. 1957, p. 1665-1668.

Chlorobenzene reacts with free methyl radicals, generated by thermal decomposition of di-*tert.*-butyl peroxide, to give a complex mixture from which a small quantity of 3:3'-dichloro-4:4'-dimethyldiphenyl was isolated. The presence of chlorotoluenes was detected by vaporphase chromatography, and confirmed chemically in the case of the *para*-isomer.

11265 Exchange Studies of Certain Chelate Compounds of the Transitional Metals. II. The Rate of Racemisation and Dissociation of the Tris-(1:10-Phenanthroline)Nickel (II) Ion. R. G. Wilkins and M. J. G. Williams. *Chemical Society, Journal*, Apr. 1957, p. 1763-1769.

11266 The Synthesis of Some Olefinic Acids Using Tetrahydro-β Halogeno-Furan and -Pyran Derivatives as Intermediates. M. F. Ansell and S. S. Brown. *Chemical Society, Journal*, Apr. 1957, p. 1788-1795.

The preparation of some cyclic β-halogeno-ethers is described. The alkenols obtained by their ring scission are used in syntheses of some alk-4-, -5-, and -6-enoic acids.

11267 Triethylenediamine (1:4-Diaza*bicyclo* [2:2:2] Octane) and Hexaethylenetetramine. III. The Interaction of 2:2':2"-Trichlorotriethylamine Hydrochloride and Dimethylamine. Frederick G. Mann and F. C. Baker. *Chemical Society, Journal*, Apr. 1957, p. 1881-1899.

A reinvestigation of the interaction of 2:2':2"-trichlorotriethylamine monohydrochloride and methanolic dimethylamine, and thermal decomposition of certain of the products.

11268* (German.) Thiazoloquinoline. **Thiazolochinoline. I.** Thiazolo [4.5-b] Quinoline Substituted in the Thiaxole Nucleus. **Im Thiazolkern Substituierte Thiazolo [4.5-b] Chinoline.** I. Tănăsescu and I. Dénes. *Chemische Berichte*, v. 90, no. 4, 1957, p. 495-499.

A study of the oxidation of 2-mercapto-thiazolo [4.5-b] quinoline and a determination of the reactivity of the sulfo-group of thiazolo [4.5-b] quinolyl-sulfonic acid. Production of derivatives.

11269* (French.) Fluorinated Organic Derivatives. **Dérivés fluorés organiques.** L. Foulletier. *Chimie & Industrie*, v. 77, Apr. 1957, p. 783-793.

Preparation, properties, and uses.

11270* (Spanish.) Reactions of Propylene With Mercury Salts. **Reacciones del propileno con sales mercúricas.** J. L. Martinez Cordon and Vincente Gomez Aranda. *Combustibles*, v. 17, Jan.-Feb. 1957, p. 12-34 + 1 plate.

A study of mercury-propanol crystallization; preparation of halides (chloride, iodide, fluorides). Application of the acid nitric-oxide Hg system. Sulfuric acid tests. Isolating mercury-propanol sulfates.

11271* (English.) **Amino Acids. XXXVII. Synthesis of Aminohydroxy Acids From α-Amino Acids.** K. Balenović, D. Cerar, and N. Bregant. *Croatica Chemica Acta*, v. 28, no. 4, 1956, p. 279-285.

11272* (English.) **Synthesis of Some Quaternary Ammonium Salts Derived From Esters of Dihydromuconic Acid.** D. Fleš and A. Markovac-Prpić. *Croatica Chemica Acta*, v. 28, no. 4, 1956, p. 299-301.

11273* (Russian.) Handbook of Magnesium-Organic Compounds. S. T. Yoffe and A. N. Nesmeyanov. v. I, II, and III.

711, 661, and 643 p. Pergamon Press, New York. (QD412.M4 Io2h Ref.)

Detailed data on formulas, reactions, and end-products.

11274* Handbook of Solvents. v. I. Pure Hydrocarbons. Ibert Mellan. 249 p. 1957. Reinhold Publishing Corp., New York. (TP247.5 M48h Ref.)

The hydrocarbon solvents are classified in accordance with their distillation range. A wide range of properties is given in tabular form for each.

11275 The Esters of the Acids of Phosphorus as Solvents. L. L. Burger. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)*, HW-44888, Jan. 1957, 25 p. (UF767 Un3.1hw Contin.)

An increase in solubility and viscosity, a decrease in density, and a decrease in the stretching frequency of the phosphoryl bond are noted on passing from phosphate to phosphonate to phosphinate to phosphine oxide. The extraction ability of these compounds for U increases in the order phosphate $<$phosphonate $<$phosphinate $<$phosphine oxide.

11276 (German.) C-Alkaloid T (Sarpagin Methyl Ether, Lochnerin?). **Über C-Alkaloid T (Sarpaginmethyläther, Lochnerin?).** W. Arnold, W. von Philipsborn, H. Schmid, and P. Karrer. *Helvetica Chimica Acta*, v. 40, no. 3, 1957, p. 705-716.

The C-alkaloid T on reaction with CH_3I and methanol at 37 C yields the iodomethylate which, after recrystallization from acetone, melts at 235-238 C.

11277 (German.) Study of C-Calebassines and Isocalebassines. **Zur kenntnis des C-Calebassins und Isocalebassins.** K. Bernauer, H. Schmid, and P. Karrer. *Helvetica Chimica Acta*, v. 40, no. 3, 1957, p. 731-736.

Preparation of isocalebassine iodide-hydroiodide, $C_{40}H_{50}O_2N_4I_2$, HI, which is formed by heating calebassine iodide with concd. HCl and crystallization of the isomerates from diluted, NaI-containing HCl. Tetrahydro- and isotetrahydro-calebassine-hydroiodide were also prepared. Emdedegradation reactions are described.

11278 (German.) The Methylation and Ethylation Products of Tetrahydrocarbazols. **Die Methylierungs- und Äthylierungsprodukte des Tetrahydro-carbazols.** F. Berlage and P. Karrer. *Helvetica Chimica Acta*, v. 40, no. 3, 1957, p. 736-740.

The 9,11-dialkyl-$\Delta^{9,10}$-carbazoleninium iodides formed by methylation and ethylation, and the bases formed by treatment with alkali were spectrophotometrically investigated.

11279 (German.) Synthesis of 18-Carboxy-Sterioidene. **Synthese von 18-Carboxy-steroiden.** K. Heusler, H. Ueberwasser, P. Wieland, and A. Wettstein. *Helvetica Chimica Acta*, v. 40, no. 3, 1957, p. 787-815.

A number of intermediates for a synthesis of aldosterone were prepared from the known *d,l*-$\Delta^{8}a$ 1-oxo-4β-hydroxy-4bβ-methyl-7-ethylenedioxy-4aα, 10aβ-dodecahydro-phenanthrene.

11280* (Russian.) Studying the Process of Formation of Carbon Dioxide When Obtaining Divinyl From Butane-Butylene Mixtures. **Issledovanie protsessa obrazovaniia uglekislogo gaza pri poluchenii divinila iz butan-butilenovykh smesei.** A. A. Balandin, M. B. Neiman, O. K. Bogdanova, G. V. Isaguliants, A. P. Shcheglova, and E. I. Popov. *Izvestiia Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk*, no. 3, Mar. 1957, p. 270-273.

Determination of reaction rates. The CO_2 is obtained primarily from the decomposition of divinyl.

11281* (Russian.) Investigations in the Field of Vinylaryl Ethers. **Issledovanie v oblasti vinilarilovykh efirov. V.** Some Properties of Vinyl-β-Naphthyl Ether. **Nekotorye svoistva vinil-β-naftilovogo efira. VI.** Some Properties and Transformations of Vinylcyclohexyl Ether and Its Derivatives. **Nekotorye svoistva i prevrashcheniia viniltsiklogeksilovogo efira i ego Proizvodnykh.** A. V. Bogdanova, M. F. Shostakovskii, and G. K. Krasil'nikova. *Izvestiia Akademii Nauk SSSR, Otdelenie Khimicheskikh Nauk*, no. 3, Mar. 1957, p. 339-352.

11282 Infra-Red Spectra of Quinol Clathrate Compounds. R. M. Hexter and T. D. Goldfarb. *Journal of Inorganic and Nuclear Chemistry*, v. 4, no. 3-4, 1957, p. 171-178.

11283 Improved Method for the Synthesis of Alkyl Azides. Eugene Lieber, Tai Siang Chao, and C. N. Ramachandra Rao. *Journal of Organic Chemistry*, v. 22, Mar. 1957, p. 238-240.

Method involves the use of Carbitols as solvents for the interaction of an alkyl halide and sodium azide, eliminates the hazards and restrictions of sealed tubes and the formation of troublesome azeotropes.

11284 Macro Rings Containing Carbon, Oxygen and Sulfur. Marshall Kulka. *Journal of Organic Chemistry*, v. 22, Mar. 1957, p. 241-244.

Eight- and nine-membered ring compounds were synthesized in almost quantitative yields from the corresponding 2-chloroalkoxybenzylisothiuronium chlorides. 2-(2-hydroxy-3-chloropropoxy)-5-chlorobenzylisothiuronium chloride undergoes degradation and cyclization in dilute alkali to form the eight-membered ring compound 3-hydroxy-8-chloro-2,3-dihydrobenzo [g]-1,5-oxathiocin.

11285 Use of Mixed Carboxylic-Carbonic Anhydrides for Acylations on Carbon and Oxygen. D. Stanley Tarbell and John A. Price. *Journal of Organic Chemistry*, v. 22, Mar. 1957, p. 245-250.

11286 Organotin Compounds: Cyclopentadienyl and Related Derivatives. Henry Gilman and Lewis A. Gist, Jr. *Journal of Organic Chemistry*, v. 22, Mar. 1957, p. 250-255.

Preparation and characteristics.

11287 Organometallic Reactions of ω-Fluoroalkyl Halides. II. Reactions of ω-Fluoroalkylmagnesium Chlorides. W. C. Howell, W. J. Cott, and F. L. M. Pattison. *Journal of Organic Chemistry*, v. 22, Mar. 1957, p. 255-259.

Reactions with such reagents as acid chlorides, acid anhydrides, ethylene oxide, benzonitrile, and triethyl orthoformate led to new methods for preparing ω-fluorocarboxylic esters, ω-fluoroalkyl ketones, ω-fluoroalcohols, and ω-fluoroaldehydes.

11288 Nitrogen Compounds of the Phosphoric and Phosphonic Acids. III. Preparation and Properties of Amides of Phenylphosphonic and Phenylphosphonothioic Acids. William C. Smith and L. F. Audrieth. *Journal of Organic Chemistry*, v. 22, Mar. 1957, p. 265-267.

11289 Pyridylethylation of Active Hydrogen Compounds. VI. Reactions of Ketones, Alkylpyridines, and Alkylquinolines With 2- and 4-Vinylpyridine. George Magnus and Robert Levine. *Journal of Organic Chemistry*, v. 22, Mar. 1957, p. 270-273.

11290 Pyrimidines. VII. Cyclization of Ethyl Oxalate and Ethyl α-Oxalylpropionate With Urea and Certain of Its Analogs. P. H. Laursen, W. A. Thews, and B. E. Christensen. *Journal of Organic Chemistry*, v. 22, Mar. 1957, p. 274-277.

11291 Synthesis and Characterization of Nitraminotetrazoles. James A. Garrison and Robert M. Herbst. *Journal of Organic Chemistry*, v. 22, Mar. 1957, p. 278-283.

Preparation of several 1-alkyl-5-nitramino- and 5-alkyl-nitraminotetrazoles. Comparison of the apparent dissociation constants and ultra-violet absorption spectra of these compounds and of 5-nitraminotetrazole indicates that the strong first dissociation of the latter is associated with the H of the nitramino group.

11292 Santonin and Related Compounds. XI. Bromination and Dehydrobromination of *cis*-9-Methyl-3-Decalone. Masaiti Yanagita and Koji Yamakawa. *Journal of Organic Chemistry*, v. 22, Mar. 1957, p. 291-297.

11293 Aminomethlylation of Ferrocene to Form *N,N*-Dimethylaminomethylferrocene and Its Conversion to the Corresponding Alcohol and Aldehyde. Jacque K. Lindsay and Charles R. Hauser. *Journal of Organic Chemistry*, v. 22, Apr. 1957, p. 355-358.

Ferrocene was aminomethylated with formaldehyde and dimethylamine in glacial acetic acid to form *N,N*-dimethylaminomethylferrocene, the methiodide of which was converted by sodium hydroxide to hydroxymethylferrocene. This primary alcohol was oxidized with manganese dioxide to the corresponding aldehyde without affecting the iron in the molecule which is known to be sensitive to oxidation. Appropriate derivatives of the alcohol and aldehyde were prepared.

11294 Quaternary Hydrazones and Their Rearrangement. Peter A. S. Smith and E. E. Most, Jr. *Journal of Organic Chemistry*, v. 22, Apr. 1957, p. 358-362.

The dimethylhydrazones of several aliphatic and aromatic ketones were prepared, and converted into methiodides which yielded *N,N,N*-trimethylhydrazinium iodide on hydrolysis. The quaternary hydrazones would not undergo a Beckmann type of rearrangement on heating alone, but with sodium ethoxide the Neber variant occurred on compounds having α-hydrogens. The molecular refractions of the dimethylhydrazones and the spectral characteristics of them and their methiodides are reported.

11295 Mechanism of the Willgerodt Reaction. Studies With 1-Tetralones. William G. Dauben, Richard P. Ciula, and John B. Rogan. *Journal of Organic Chemistry*, v. 22, Apr. 1957, p. 362-365.

The reaction of 6-methoxy-1-tetralone with S and morpholine yielded 6-methoxy-2-morpholinonaphthalene, showing that attack occurred on the C atom adjacent to the carbonyl group. The role of a 2-morpholino-1-tetralone and a 1,2-dihydronaphthalene in this reaction was studied and it was shown that neither compound was an intermediate.

11296 Physical Properties of the Aminoazobenzene Dyes. IV. The Position of Proton Addition. Eugene Sawicki. *Journal of Organic Chemistry*, v. 22, Apr. 1957, p. 365-367.

The basicity and absorption spectra of some azo dyes were correlated with the position of proton addition to these dyes. Further spectral evidence was given for the tautomer concept of proton addition to the 4-aminoazobenzene dyes.

11297 Organotin Compounds Containing Water-Solubilizing Groups: Some *m*-Hydroxyphenyl Derivatives. Henry Gilman and Lewis A. Gist, Jr. *Journal of Organic Chemistry*, v. 22, Apr. 1957, p. 368-371.

Triphenyl-*m*-hydroxyphenyltin, diphenyldi-*m*-hydroxyphenyltin, phenyltri-*m*-hydroxyphenyltin, and tetra-*m*-hydroxyphenyltin were prepared. All are insoluble in water while their solubility in base increases as the number of hydroxyphenyl groups increases. Triphenyl-*m*-hydroxyphenyltin reacts with ethyl bromoacetate to give ethyl *m*-triphenylstannyl-phenoxyacetate.

11298 Diethyl *N*-Arylsulfonylphosphoramidates. Rudi Rätz. *Journal of Organic Chemistry*, v. 22, Apr. 1957, p. 372-374.

Diethyl esters of *N*-arylsulfonylphosphoramidic acids were synthesized by condensation of various sulfonamide sodium salts and diethyl phosphorochloridate. The chemical behavior of this new type of phosphorus compounds is that of monobasic acids. Tetraethyl *N*-arylsulfonyliminodiphosphates could be isolated as by-products.

11299 Adducts of Alkali Metals With Azobenzene. J. W. B. Reesor and George F. Wright. *Journal of Organic Chemistry*, v. 22, Apr. 1957, p. 375-381.

Adducts were prepared directly from azobenzene and two atom equivalents of Li, Na, and K. In general these dimetal adducts are less reactive than the analogous stilbene-dimetal adducts. Benzyl chloride, which couples to diphenylethane upon treatment with stilbene-disodium adduct, gives a good yield of *N,N'*-dibenzyl-*N,N'*-diphenyl-hydrazine.

11300 Arsenobenzene-Dimetal Adducts. J. W. B. Reesor and George F. Wright. *Journal of Organic Chemistry*, v. 22, Apr. 1957, p. 382-385.

The preparative method for arsenobenzene was improved. The arsenobenzene-disodium adduct was prepared and characterized by treatment with methyl chloride, with dimethyl sulfate, and with carbon dioxide. By further addition of Na to the disodium adduct a new type, so-called arsenobenzene-tetrasodium adduct, was prepared which gives reactions characteristic of phenyldisodiumarsine. This tetrasodium adduct and arsenobenzene exist in mobile equilibrium with the arsenobenzenedisodium adduct.

11301 Phosphorobenzene-Alkali Metal Adducts. J. W. B. Reesor and George F. Wright. *Journal of Organic Chemistry*, v. 22, Apr. 1957, p. 385-387.

Phosphorobenzene was shown to exist in mono-, di-, and polymeric forms. Each of these forms is converted by treatment with metallic Na in 2,5-dioxahexane to the phosphorobenzenedisodium adduct. This adduct is converted by methyl chloride into the oxygen-sensitive dimethyldiphenylbiphosphine and by benzoyl chloride into dibenzoyldiphenyl-biphosphine.

11302 Synthesis of Some 4-Hydroxycoumarin Derivatives. N. J. Desai and Suresh Sethna. *Journal of Organic Chemistry*, v. 22, Apr. 1957, p. 388-390.

The synthesis of 4,5-dihydroxy-, 4,5-dihydroxy-6-methoxy-, and 4,7,8-trihydroxycoumarin is described.

11303 Substituted 1,10-Phenanthrolines. X. Ethyl Derivatives. Francis H. Case, Zelda B. Jacobs, Richard S. Cook, and Jack Dickstein. *Journal of Organic Chemistry*, v. 22, Apr. 1957, p. 390-393.

The preparation of the following compounds, together with necessary intermediates, is described: 3-, 4-, and 5-ethyl-1,10-phenanthrolines; 3,8-, 4,6-, 4,7-, and 5,6-diethyl-1,10-phenanthrolines.

11304 Steric Requirements in the Cyclization of Naphthalene Derivatives. Carl Djerassi and George R. Pettit. *Journal of Organic Chemistry*, v. 22, Apr. 1957, p. 393-396.

11305 4-Imidazolidinethiones. John D. Christian. *Journal of Organic Chemistry*, v. 22, Apr. 1957, p. 396-399.

The isolation of 2,2,5,5-tetramethyl-4-imidazolidinethione from the reaction of acetone cyanohydrin with CS_2 and NH_4OH was verified. High yields of this and other substituted 4-imidazolidinethiones were obtained by the reaction of ketones with $(NH_4)_2S$ and either HCN or alkali cyanide.

11306 Synthesis of Azacycloheptane Derivatives Related to Piperidine Analgesics. Julius Diamond, William F. Bruce, and Floyd T. Tyson. *Journal of Organic Chemistry*, v. 22, Apr. 1957, p. 399-405.

A synthesis of seven-membered ring compounds related to meperidine was effected by the stepwise reaction of 2-phenyl-4-dimethylaminobutyronitrile with trimethylene halides.

11307 Selenium Derivatives of $\Delta^{1},^{4}$-3-Ketosteroids. K. Florey and A. R. Restivo. *Journal of Organic Chemistry*, v. 22, Apr. 1957, p. 406-409.

In reacting Δ^{4}-3-ketosteroids with SeO_2 the corresponding $\Delta^{1},^{4}$-3-ketosteroids and/or their monoselenium derivatives were isolated. Transformation products of the Se compounds are described.

11308 Flavothebaone. II. Exhaustive Methylation of Flavothebaone Trimethyl Ether. III. Structure of Flavothebaone. IV. Degradation of *N*-Oxides and Exhaustive Methylation of Reduced Methines. K. W. Bentley, J. Dominguez, and J. P. Ringe. **V. Anomalous Beckmann Transformations.** K. W. Bentley and J. P. Ringe. *Journal of Organic Chemistry*, v. 22, Apr. 1957, p. 409-429.

11309 Structure of Isothebaine. K. W. Bentley and S. F. Dyke. *Journal of Organic Chemistry*, v. 22, Apr. 1957, p. 429-433.

4,6-Dimethoxy-5-ethoxyaporphine was synthesized by a combination of the Bischler-Napieralski *iso*-quinoline and the Pschorr phenanthrene syntheses, and found to be identical with *iso*thebaine ethyl ether.

11310 Synthesis of C^{14} Labeled Anthracene, 9-Methylanthracene and 1,2-Benzanthracene. Herbert I. Hadler and C. R. Raha. *Journal of Organic Chemistry*, v. 22, Apr. 1957, p. 433-435.

The synthesis of anthracene, 9-methylanthracene, and 1,2-benzanthracene labeled with C^{14} in the 9,10 positions is described.

11311 Vinyl Derivatives of the Metals. III. Vinylmercuric Halides. Dietmar Seyferth. *Journal of Organic Chemistry*, v. 22, Apr. 1957, p. 478.

The lability of the vinyl-tin bond is utilized to prepare the vinylmercuric halides by preferential cleavage of the vinyl group from alkylvinyltin compounds with mercuric chloride, bromide, or iodide.

11312 Bimolecular Compounds From Dissolving-Metal Reductions of *N*-Heterocyclics. I. W. Elliott, Jr. and R. B. McGriff. *Journal of Organic Chemistry*, v. 22, May 1957, p. 514-516.

Isoquinoline and its 3-methyl homolog yield the corresponding diacyltetrahydrobiisoquinolines by reduction with Zn dust in either acetic anhydride or benzoyl chloride. From a similar reduction of acridine, biacridanyl is obtained.

11313 Synthesis of Some Dibenzothiophene Derivatives. Henry Gilman and Gene R. Wilder. *Journal of Organic Chemistry*, v. 22, May 1957, p. 523-526.

Several derivatives were synthesized by the use of a halogen-metal interconversion reaction on the corresponding bromo compound followed by a reaction with the desired precursor. The oxidation of dibenzothiophene compounds using 30% H_2O_2 in glacial acetic acid was shown to be a convenient method for the synthesis of various sulfones.

11314 Anodic Oxidation of Aryl Activated Methylene Groups. Richard E. Juday. *Journal of Organic Chemistry*, v. 22, May 1957, p. 532-535.

Anodic oxidation produced alcohols and ketones from activated methylene groups. Tertiary butyl ethers were also formed in some cases when *tert*-butyl alcohol was present.

11315 Reactions of Acetylenic Compounds Under Hydroformylation Conditions. Harold Greenfield, John H. Wotiz, and Irving Wender. *Journal of Organic Chemistry*, v. 22, May 1957, p. 542-546.

The reaction of 1-pentyne with Co and H in the presence of Co catalyst at elevated temperatures and pressures produces low yields of the same C_6 alcohols as are obtained from the hydroformylation of 1-pentene. The reaction of acetylene with stoichiometric quantities of Co-hydrocarbonyl at room temperature and atmospheric pressure results in the formation of propionaldehyde.

11316 Reactions of Phthalaldehydic Acid. D. D. Wheeler, D. C. Young, and D. S. Erley. *Journal of Organic Chemistry*, v. 22, May 1957, p. 547-556.

Uncatalyzed reactions with a number of alcohols, thiols, amines, amides, sulfonamides, ureas, carbamates, and acid anhydrides were studied. The free acid and most of its derivatives exist in the phthalide form.

11317* Synthetic Experiments in the Benzopyrone Series. LXII. Isomerization of 2:6 - Dimethyl-5:7:8 - Trihydroxy Chromone Derivatives. S. K. Mukerjee, T. R. Rajagopalan, and T. R. Seshadri. **LXIII. Synthesis of α-Methyl-Furano Isoflavones.** P. S. Sarin, J. M. Sehgal, and T. R. Seshadri. *Journal of Scientific & Industrial Research*, v. 16B, Feb. 1957, p. 58-64.

11318* Studies in the Chemical Composition of *Ailanthus Malabarica DC.* R. P. Rastogi and M. L. Dhar. *Journal of Scientific & Industrial Research*, v. 16B, Feb. 1957, p. 74-80.

A tentative partial structure is assigned to malanthin, a crystalline steroid ($C_{21}H_{30}O_4$), on the basis of its ultraviolet and infrared absorption spectra and other data.

11319 Oxine and Its Derivatives. R. G. W. Hollingshead. v. III-IV. 278 and 314 p. 1956. Butterworths Scientific Publications, London. (QD77 H72o)

Comprehensive data on preparation, structure, properties, and reactions.

11320* (English.) **Reactivity of 3,5-Disubstituted Derivates of Pyridine-N-Oxide Towards Sulphuryl Chloride.** H. J. Den Hertog and C. Hoogzand. *Recueil des Travaux Chimiques des Pays-Bas*, v. 76, Mar. 1957, p. 261-266.

The action of SO_2Cl_2 on 3,5-dibromopyridine-N-oxide at 120 C yields a mixture of chiefly 2-chloro-3,5-dibromopyridine along with a considerable amount of 4-chloro-3,5-dibromopyridine. Reaction at lower temperatures yielded a product from which 2,6-dichloro- and 2,4,6-trichloro-3,5-diethoxypyridine-N-oxide were isolated.

11321 Solvents. Thomas H. Durrans. v. IV. 7th Rev. Ed. 244 p. 1957. D. Van Nostrand Co., Princeton, New Jersey. (TP247.5 D93s7)

Properties and characteristics of hydrocarbons, alcohols, ketones, esters, glycols, cyclohexane derivatives, chloro-compounds, furanes, and plasticising solvents.

11322* (English.) **Preservation of Carboxymethyl Cellulose Solutions.** Lars Gustaf Anderson. *Svensk Papperstidning*, v. 60, Apr. 30, 1957, p. 293-298.

Phenylmercuric nitrate and "Pulpasan OX" were best and –0.05 g. per l. gave full protection. Dichlorophene and 8-hydroxyquinoline were effective at 0.25 g. per l. of solution. Other additives did not maintain the solution at the required viscosity.

11323* Alicyclic Studies. X. The Bicyclo-(5:4:0)-2-Undecanones. David Ginsburg and Walter J. Rosenfelder. **XI. Attempted Syntheses of 5:6-Benzazulene and Benzheptalenes. XII. An Alicyclic Synthesis of 2:3,6:7-Dibenzotropone.** Yaacov Amiel and David Ginsburg. *Tetrahedron*, v. 1, Apr. 1957, p. 3-21.

11324* By-Products of the Permanganate Oxidation of Strychnine. J. T. Edward and R. Robinson. *Tetrahedron*, v. 1, Apr. 1957, p. 28-37.

Hydroxydihydrostrychninone - A and hydroxycuninecarboxylic acid were identified among the oxidation products of strychnine.

11325* Syntheses in the Quinazolone Series. VI. The Synthesis of 1:2:3:4-Tetrahydro-2-Aryl-4-Oxoquinazolines. T. A. Kilroe Smith and Henry Stephen. *Tetrahedron*, v. 1, Apr. 1957, p. 38-44.

An investigation of the isomeric change of N^2-arylideneorthanilamides led to the synthesis of a new series of 1:2:3:4-tetrahydro-4-oxoquinazolines from which the corresponding quinazol-4-ones were obtained by oxidation.

11326* Steroids and Related Compounds. I. Synthesis of 1:2:3:4:9:10:11"β":12"α"-Octahydro-7-Methoxy-2"α":8:11"β"-Trimethyl-3-Oxophenanthrene. M. J. Temple Robinson. *Tetrahedron*, v. 1, Apr. 1957, p. 49-66.

11327* Heterolytic Decomposition of Onium Compounds (Diphenyl Halogenonium and Triphenyloxonium Salts). A. N. Nesmeyanov, L. G. Makarova, and T. P. Tolstaya. *Tetrahedron*, v. 1, Apr. 1957, p. 145-157.

An investigation of the various types of exchange reaction involved.

11328* (Russian.) Synthesis and Properties of Silicon Hydrocarbons and Their Derivatives. **Sintez i svoistva kremneuglevodorodov i ikh proizvodnykh.** A. D. Petrov, V. F. Mironov, and E. A. Chernyshev. *Uspekhi Khimii*, v. 26, Mar. 1957, p. 292-344.

Direct synthesis of silico-organic compounds. Halogenation and dehydrohalogenation of the compounds; Friedel-Craft reactions. Silicon hydrocarbons of aliphatic aromatic, fatty-aromatic, and the naphthene series. Polymerization and copolymerization of alkenylsilanes.

11329* (German.) Alkinyl Compounds From Transition Metals. **Alkinyloverbindungen von Übergangsmetallen. VII.** Iron Alkinyl-Pentacyanocomplexes. **Alkinylo-pentacyanokomplexe von Eisen.** R. Nast and F. Urban. *Zeitschrift für Anorganische und Allgemeine Chemie*, v. 289, Mar. 1957, p. 244-249.

By converting potassium salts of acetylene, propine, and phenylacetylene with dipotassium-nitrosyl-pentacyanoferrate in liquid ammonia in absence of air and moisture, stable diamagnetic potassium-alkinyl-pentacyano-ferrates were obtained in the pure state.

11330* (German.) Boron-Nitrogen Bond. **Über die Bor-Stickstoff-Bindung. V.** Production and Vibration Spectra of Some Borazens With an Aromatic CC-Bond Conjugated With the B=N Bond. **Darstellung und Schwingungsspektren einiger Borazene mit zur B=N-Bindung konjugierter aromatischer CC-Bindung.** Hermann J. Becher. *Zeitschrift für Anorganische und Allgemeine Chemie*, v. 289, Mar. 1957, p. 262-278.

Pure dimethyl-N-phenylaminoboron was obtained from borotrimethyl and aniline. Further borazens with systems of multiple bonds conjugated with the BN Bond were obtained from borotrichloride.

11331* (German.) Metal Carbonyls. **Über Metallcarbonyle. LXXVII.** Evolution of Nuclear Carbonylferrate From Nuclear Iron Carbonyls. **Entstehung mehrkerniger Carbonylferrate aus mehrkernigen Eisencarbonylen. LXXVIII.** Phenomena Taking Place in the Iron Tetracarbonyl-Methanol System. **Die Vorgänge im System Eisentetracarbonyl-Methanol.** W. Hieber and G. Brendel. *Zeitschrift für Anorganische und Allgemeine Chemie*, v. 289, Mar. 1957, p. 324-344.

11332* (Russian.) Isomerization of Polymethylene Hydrocarbons With Aluminum Chloride as Catalyst. **Izomerizatsiia polimetilenovykh uglevodorodov pod vliianiem khloristogo aliuminiia. XX.** Isomerization of Spiro-(4,5)-Decane. **Isomerizatsiia spiro-(4,5)-dekana.** M. B. Turova-Poliak, I. E.

Sosnina, and T. P. Iudkina. *Zhurnal Obshchei Khimii*, v. 27, Mar. 1957, p. 586-589.

Trans-decahydronaphthalene is the product of isomerization of spiro-(4,5)-decane with an aluminum chloride catalyst. The optimum reaction temperature is 75 C where the yield of decahydronaphthalene is 93 to 94%. More extensive isomerization products are formed by increasing the temperature.

11333* (Russian.) Catalytic Transformations of Alkyldichlorosilanes and Dialkylchlorosilanes in the Presence of Aluminum Chlorides. **Kataliticheskie prevrashcheniia alkildikhlorsilanov i dialkilkhlorsilanov v prisutstvii khloristogo aliuminiia.** B. N. Dolgov, M. G. Voronkov, and S. N. Borisov. *Zhurnal Obshchei Khimii*, v. 27, Mar. 1957, p. 709-716.

A study of the interaction of ethyldichlorosilane and butyldichlorosilane with aluminum chloride and ferric chloride. Ethyldichlorosilane when distilled with aluminum chloride degrades into ethylchlorosilane and ethyltrichlorosilane. Butyldichlorosilane also reacts in an analogous way, but less rapidly.

11334* (Russian.) Reaction of Triethylsilane With Alkyl Halides. **Reaktsiia Trietilsilana s galogenalkilami.** B. N. Dolgov, S. N. Borisov, and M. G. Voronkov. *Zhurnal Obshchei Khimii*, v. 27, Mar. 1957, p. 716-719.

A study of the interaction of trialkylsilanes with alkyl-, cycloalkyl-, alkenyl-, and arylhalides. Catalytic quantities of anhydrous aluminum chloride call forth a vigorous exothermal reaction of combined hydration and halogenation, which causes the formation of the corresponding hydrocarbon and trialkylhalidesilane.

11335* (Russian.) Dependence of the Yields of Tetrasubstituted Alkyl and Aryl Monosilanes on the Size of the Charges and the Radii of the Fluosilicates. **O zavisimosti vykhodov chetyrekhzameshchennykh alkil- i arilmonosilanov ot velichin zariadov i radiusov kationov kremneftoristovodorodnykh solei.** G. V. Medoks and E. M. Soshestvenskaia. *Zhurnal Obshchei Khimii*, v. 27, Mar. 1957, p. 720-724.

A study of the interaction of fluosilicates of Li, Na, K, and Rb with benzyl magnesium chloride and ethyl magnesium bromide. It was found that the yields of tetrabenzylsilanes and tetraethylsilanes are in a relationship of linear dependence on the radii of the cations. An analogous regularity was also shown during the reactions of benzyl magnesium chloride with fluosilicates of Ca, Sr, and Ba, although the increase of the charge of the cations causes a severe decrease in the yields of tetrasubstituted monosilane.

11336* (Russian.) Interaction of Tetraethoxysilane With Aluminum Glyceride. **O vzaimodeistvii tetraetoksisilana s glitseratom aliuminiia.** A. N. Chivikova. *Zhurnal Prikladnoi Khimii*, v. 30, Mar. 1957, p. 454-460.

A series of alumino-silicic compounds of the type x $Al_2O_3 \cdot y\ SiO_2 \cdot z\ H_2O$ was obtained as a result of the saponification of the product of interaction of tetraethoxysilane with aluminum glyceride during heating in a glycerine solution.

See also: **11194** (chromatography of organic compounds); **11196** (synthesis of dithiazone derivatives); **11477** (glycol blends in oxidizing alkyds); **12304** (chelating resins).

CHEMISTRY—PHYSICAL

11337 (German.) The Pressure Broadening in the Argon Spectrum. **Die Druckverbreiterung im Argonspektrum.** Karl Lang. *Acta Physica Austriaca*, v. 11, no. 1, 1957, p. 76-87.

An experimental investigation of the dependence of the width of a group of argon spectrum lines on the gas pressure showed an increase of the band width at 50% and below proportional to the gas thickness. Analogy between the argon lines and neon lines, as regards pressure broadening.

11338 Thermal Decomposition of Lead Carbonate. E. A. Peretti. *American Ceramic Society, Journal*, v. 40, May 1957, p. 171-173.

The solid phases formed by three stages of decomposition were found to be $PbO \cdot PbCO_3$, $2PbO \cdot PbCO_3$, and PbO in the order of increasing temperature.

11339 Heats of Combustion and Formation of Metal Carbonyls. II. Nickel Carbonyl. A. K. Fischer, F. A. Cotton, and G. Wilkinson. *American Chemical Society, Journal*, v. 79, May 5, 1957, p. 2044-2046.

11340 Near Ultraviolet Absorption Spectra of the Pyridine Monocarboxylic Acids in Water and Ethanol Solutions. Harold P. Stephenson and H. Sponer. *American Chemical Society, Journal*, v. 79, May 5, 1957, p. 2050-2056.

Changes in the spectra which occur when the solvent is changed from ethanol to water are interpreted to show that the pyridine monocarboxylic acids exist primarily in the neutral, undissociated form in ethanol, and in the anion and zwitterion forms in water.

11341 Low Temperature Heat Capacities and Entropies at 298.15°K. of Cryolite, Anhydrous Aluminum Fluoride and Sodium Fluoride. E. G. King. *American Chemical Society, Journal*, v. 79, May 5, 1957, p. 2056-2057.

11342 On the Solubility of Ag_2SO_4 in Various Electrolyte Media. Effects of the Solubility of Ag_2SO_4 and AgCl on the Ag, Ag_2SO_4 and the Ag, AgCl Electrodes. M. H. Lietzke and R. W. Stoughton. *American Chemical Society, Journal*, v. 79, May 5, 1957, p. 2067-2071.

11343 Some Phase Relationships in the Three-Component Liquid System CO_2-H_2O-C_2H_5OH at High Pressures. Louis C. W. Baker and Thomas F. Anderson. *American Chemical Society, Journal*, v. 79, May 5, 1957, p. 2071-2074.

Phase diagrams are reported covering the range 10 to 50 C at pressures from 3000 psi. down to the vapor pressures of the respective mixtures. Liquid-vapor critical data are included.

11344 The Pyrolysis of Lead Oxalate; Isotope Effects and Product Composition. Peter E. Yankwich and James L. Copeland. *American Chemical Society, Journal*, v. 79, May 5, 1957, p. 2081-2086.

Composition and isotopic constitution of gaseous products over the temperature range 350 to 625 C.

11345 Electron Spin Resonance Study of the Electron Exchange Between Naphthalene Negative Ion and Naphthalene. R. L. Ward and S. I. Weissman. *American Chemical Society, Journal*, v. 79, May 5, 1957, p. 2086-2090.

Reaction rate was determined spectroscopically. Rate constants vary with solvent and with the choice of positive ion. They lie in the range 10^7-10^9 liter $mole^{-1}$ $sec.^{-1}$.

11346 An Improved Microcatalytic Technique. W. Keith Hall and P. H. Emmett. *American Chemical Society, Journal*, v. 79, May 5, 1957, p. 2091-2093.

Method is capable of yielding reproducible catalyst testing data. Utility of the method in a kinetic study of the catalytic hydrogenation of ethylene is illustrated.

11347 Primary Quantum Yield for the Dissociation of Iodine Molecules in Carbon Tetrachloride Solution and the Rate Constant for the Recombination Reaction. R. L. Strong and J. E. Willard. *American Chemical Society, Journal*, v. 79, May 5, 1957, p. 2098-2102.

11348 The Association of 4-Methylimidazole With the Ions of Cupric Copper and Zinc; With Some Observations on 2,4-Dimethylimidazole. Yasuhiko Nozaki, Frank R. N. Gurd, Raymond F. Chen, and John T. Edsall. *American Chemical Society, Journal*, v. 79, May 5, 1957, p. 2123-2129.

11349 Potentiometric Study of Gelatin and Its Methyl Ester. Sam Katz and Paul H. Maurer. *American Chemical Society, Journal*, v. 79, May 5, 1957, p. 2170-2174.

The proton dissociation isotherm for gelatin was established by both titration and equilibration techniques at 37.0 ± 0.02 C and 0.15 ionic strength.

11350 Pyrimidine N-Oxides and Their Infrared Absorption Characteristics. Richard H. Wiley and Stephen C. Slaymaker. *American Chemical Society, Journal*, v. 79, May 5, 1957, p. 2233-2236.

The N-oxides show a strong band at 1255-1300 $cm.^{-1}$ assigned to the N-O stretching frequency. A second band, also characteristic of the N-oxides, appears at 847-872 $cm.^{-1}$. Evidence for the H bonding of the N-oxide with proton donors is observed in the infra-red spectra of the N-oxides in which a band near 2960 $cm.^{-1}$ appears in $CHCl_3$, but not in CCl_4 solutions.

11351 A Study of the Decomposition of *p*-Nitrophenethyltrimethylammonium Iodide by Means of the Hydrogen Isotope Effect. Ernest M. Hodnett and John J. Flynn, Jr. *American Chemical Society, Journal,* v. 79, May 5, 1957, p. 2300-2302.

Differences in reaction rates established the mechanism of decomposition as that of an attack on the H atom in the β-position to the ammonium group.

11352 Optical and Electrical Methods of Determining Transference Numbers of Electrolytes in Dilute Solutions by the Moving Boundary Technique. J. W. Lorimer, J. R. Graham, and A. R. Gordon. *American Chemical Society, Journal,* v. 79, May 20, 1957, p. 2347-2350.

Refractive index methods and conductimetric methods are compared.

11353 The Transference Numbers of Sodium and Lithium Chlorides in Anhydrous Ethanol at 25°. J. R. Graham and A. R. Gordon. *American Chemical Society, Journal,* v. 79, May 20, 1957, p. 2350-2352.

The conductimetric method of following boundary movement was used in this study.

11354 Some Buffer Solutions With Low Nucleophilic Activity. J. G. Pritchard and F. A. Long. *American Chemical Society, Journal,* v. 79, May 20, 1957, p. 2365-2368.

4-Amines are suggested because of their nonreactivity with propylene oxide in dilute aqueous solution at 50 C.

11355 The Microwave Spectra and Molecular Structure of 1,1,1-Trifluoroethane and Its Mono-, Di- and Trideutero Derivatives. Walter F. Edgell, George B. Miller, and Jonathan W. Amy. *American Chemical Society, Journal,* v. 79, May 20, 1957, p. 2391-2393.

The above were observed in a Stark modulated sweep spectrometer of the Hughes and Wilson type. Unit dimensions are presented.

11356 The Surface Catalysis of the Ortho- to Para-Conversion in Hydrogen Under Pressure at Low Temperatures. Douglas S. Chapin and Herrick L. Johnston. *American Chemical Society, Journal,* v. 79, May 20, 1957, p. 2406-2412.

11357 Effects of Structure, Product Concentration, Oxygen, Temperature and Phase on the Radiolysis of Alkyl Iodides. Evalyn O. Hornig and John E. Willard. *American Chemical Society, Journal,* v. 79, May 20, 1957, p. 2429-2434.

The yields of elemental iodine from purified degassed alkyl iodides as a function of radiation dosage were determined.

11358 Quantitative Treatment of the Elementary Processes in the Radiolysis of Alkyl Iodides by γ-Rays. Robert J. Hanrahan and John E. Willard. *American Chemical Society, Journal,* v. 79, May 20, 1957, p. 2434-2440.

The mechanism of radiolysis of alkyl iodides and the production of HI, I_2, alkyl radicals, and hydrocarbons.

11359 Ionization and Dissociation Equilibria in Liquid Sulfur Dioxide. VI. Hexaphenylethane. Harry P. Leftin and Norman N. Lichtin. *American Chemical Society, Journal,* v. 79, May 20, 1957, p. 2475-2480.

Effects of solute purity, light, and oxygen on the electrical conductivity of a SO_2 solution of hexaphenylethane.

11360* (Japanese.) **Preparation of Anion Exchange Resin Membranes of Ethyleneimine-Epichlorohydrin.** Akira Nishihara, Yasunobu Mineki, and Masakazu Sekino. *Asahi Glass Company, Reports of the Research Laboratory,* v. 6, no. 1, 1956, p. 20-29.

11361 Thiazoles. III. Infrared Spectra of Methylthiazoles. Alfred Taurins, J. G. E. Fenyes, and R. Norman Jones. *Canadian Journal of Chemistry,* v. 35, May 1957, p. 423-427.

11362 The Kinetics of the Oxidation of Ferrous Ion by Hydrogen Peroxide in the Presence of Dissolved Hydrogen and Carbon Monoxide. T. J. Hardwick. *Canadian Journal of Chemistry,* v. 35, May 1957, p. 437-443.

11363 The Dielectric Properties of Methanol and Methanol-*d*. D. W. Davidson. *Canadian Journal of Chemistry,* v. 35, May 1957, p. 458-473.

Properties between liquid N and room temperatures, at frequencies between 40 and 10^6 c.p.s.

11364 Light Absorption Studies. VII. Concerning the Relation Between the Infrared Carbonyl Stretching Bands and Ultraviolet Spectra (B-Bands) in Ring Substituted Acetophenones. W. F. Forbes and W. A. Mueller. *Canadian Journal of Chemistry,* v. 35, May 1957, p. 488-499.

11365 The Photolysis of Trifluoroacetaldehyde. R. E. Dodd and J. Watson Smith. *Chemical Society, Journal,* Apr. 1957, p. 1465-1473.

The photolysis of trifluoroacetaldehyde was studied over a wide range of temperatures and pressures by use of light of wavelength 3130 A. The products are trifluoromethane, hexafluoroethane, H, and CO.

11366 The Preparation of Stable Free Radicals in Solution by Means of Ionising Radiation. A. J. Swallow. *Chemical Society, Journal,* Apr. 1957, p. 1553-1555.

Irradiation of a mixture of an easily reduced and an easily oxidized substance gives rise to a coupled oxidation-reduction.

11367 Activity Coefficients of Nitric and Perchloric Acids in Dilute Aqueous Solution From E.M.F. and Transport-Number Measurements. A. K. Covington and J. E. Prue. *Chemical Society, Journal,* Apr. 1957, p. 1567-1572.

Precise values were obtained for the activity coefficients of nitric and perchloric acids in aqueous solutions at 25 C up to 0.1 M by combining measurements on cells with transport-number measurements. The activity coefficients are compared with those of other strong acids.

11368 Synthetic-Applications of Activated Metal Catalysts. III. Desulphurisation of Thiazoles With Raney Nickel. G. M. Badger and N. Kowanko. *Chemical Society, Journal,* Apr. 1957, p. 1652-1567.

11369 Kinetics of the Acid-Catalysed Hydrolysis and Decomposition of Ethylidene Diacetate. R. P. Bell and B. Lukianenko. *Chemical Society, Journal,* Apr. 1957, p. 1686-1689.

The kinetics of the hydrolysis of ethylidene diacetate was studied in aqueous HCl up to an acid concentration of 8.9 M.

11370 The Electric Dipole Moments of a Series of 4-Substituted Pyridines and Pyridine 1-Oxides. A. R. Katritzky, E. W. Randall, and L. E. Sutton. *Chemical Society, Journal,* Apr. 1957, p. 1769-1775.

Dipole moments together with values for substituted alkanes and benzenes afford evidence that the pyridine 1-oxide ring can create either a surfeit or deficit of electrons at the 4-position.

11371 Solutions in Sulphuric Acid. XXI. Conductivity Measurements on Some Nitro-Compounds. R. J. Gillespie and C. Solomons. **XXII. A Reinvestigation of the Electrical Conductivity of the Water-Sulphur Trioxide System, With Special Reference to the Composition of Minimum Conductivity.** R. J. Gillespie, J. V. Oubridge, and C. Solomns. *Chemical Society, Journal,* Apr. 1957, p. 1796-1811.

11372 The Barium Fluoride-Uranium Trifluoride System. R. W. M. D'Eye and F. S. Martin. *Chemical Society, Journal,* Apr. 1957, p. 1847-1851.

Studies by X-ray and density measurements and by thermal analysis.

11373* (English.) **The Adsorption of Non-Polar Gases on Alkali Halide Crystals. I. The Low-Temperature Adsorption of Non-Polar Gases on Cubic Sodium Chloride.** Teruo Hayakawa. *Chemical Society of Japan, Bulletin,* v. 30, Mar. 1957, p. 124-132.

Data on A, O, N, and CO_2.

11374* (English.) **Studies on Crystals of Metallic Tris-Ethylene-Diamine-Complexes. II. The Crystal Structure of Sodium D-Tris-Ethylenediamine-Cobalt (III) Chloride Hexahydrate, 2D- [Co en_3] $Cl_2 \cdot NaCl \cdot 6H_2O$.** Kazumi Nakatsu, Motoo Shiro, Yoshihiko Saito, and Hisao Kuroya. *Chemical Society of Japan, Bulletin,* v. 30, Mar. 1957, p. 158-164.

11375* (English.) **The Surface of Copper-Nickel Catalyst. I. The Reaction Between Hydrogen Chloride and the Catalyst. II. Adsorption of Hydrogen on Copper, Nickel,**

and Copper-Nickel Catalysts. Toyosaburo Takeuchi and Masakazu Sakaguchi. *Chemical Society of Japan, Bulletin*, v. 30, Mar. 1957, p. 177-186.

11376* (German.) Determination of Melting Point to 1/10th Degree. **Schmelzpunktbestimmung auf 1/10 Grad. II.** K. Rast. *Chemie-Ingenieur-Technik*, v. 29, Apr. 1957, p. 277-279.

The scale of fixed-point substances has been extended from 282 to 350 C. An "iron sphere apparatus" increases the ease of working.

11377* (German.) Ultra-Violet Absorption of Tertiary Vinylamine. **Zur UV-Absorption Tertiärer Vinylamine.** Rudolf Tschesche and Günther Snatzke. *Chemische Berichte*, v. 90, no. 4, 1957, p. 579-585.

Three examples showed that the introduction of a double bond in α,β position to a tertiary N has no effect on the UV spectrum of amine if the vinylamine group and the atoms immediately adjacent are prevented from assuming a coplanar arrangement.

11378* (German.) Polarographic Behavior of Periodate in a Strongly Alkaline Medium. **Das Polarographische Verhalten von Perjodat in Stark Alkalischem Milieu.** L. Jenšovský. *Collection of Czechoslovak Chemical Communications*, v. 22, Feb. 1957, p. 181-188.

An attempt was made to explain the anomalous reduction of periodate, which by its form in a strongly alkaline medium remains a maximum. There was adsorption, and a regular oscillation was observed.

11379* (French.) Electromigration of Radioactive Ions in Melted Salts. **Électromigration d'ions radioactifs dans des sels fondus.** Harirao Jeevan Arnikar. *Comptes Rendus*, v. 244, Apr. 24, 1957, p. 2241-2243.

By means of electrophoresis in melted salts performed on an asbestos paper support, the mobility at 355 C of ions Li^+, Na^+, K^+, Rb^+, Co^+, Cl^- and Br^- in melted sodium nitrate was determined.

11380* (English.) **Methories of the Precipitation Processes. XII. Mutual Influence of Silver Halides in Precipitation Processes.** B. Černicki and B. Težak. *Croatica Chemica Acta*, v. 28, no. 1, 1956, p. 13-18.

Investigations included the systems AgBr-AgI and AgCl-AgI.

11381* (English.) **Methories of Coagulation Processes. XIII. Systematic Comparison of Coagulation Values for Various Cations on Negative Silver Halogenide Sols.** E. Matijević, K. F. Schulz, and B. Težak. *Croatica Chemia Acta*, v. 28, no. 2, 1956, p. 81-91.

11382* (English.) **The Energies of Activation of the Catalytic Dehydrogenation of Primary and Secondary Alcohols.** I. Brihta and P. Luetić. *Croatica Chemica Acta*, v. 28, no. 2, 1956, p. 93-100.

Activation energies were determined on Raney-copper catalyst in the temperature interval between 150 and 250 C.

11383* (English.) **The Kinetics of the Formation of Aluminium Hydroxide by Seeding Sodium Aluminate Solutions With Hydrargillite Crystals. IV. On the "Contact-Intercrystallization".** P. Bogdanović, S. Maričić, and M. Vidan. *Croatica Chemica Acta*, v. 28, no. 3, 1956, p. 155-162.

11384* (English.) **Electrophoretic Mobility and the Isoelectric Coagulation of the Silver Iodide Sols and Suspensions.** M. Mirnik, F. Flajšman, and B. Težak. *Croatica Chemica Acta*, v. 28, no. 3, 1956, p. 167-174.

11385* The Solubility of Solids in Gases. George W. Morey. *Economic Geology*, v. 52, May 1957, p. 225-251.

Historical and theoretical aspects; review of related literature; data on the solubility of UO_3, Al_2O_3, NiO, Nb_2O_5, Ta_2O_5, BeO, and GeO_2 at 500 C, 1000 bars steam pressure.

11386 Metal-Water Reactions. IV. Kinetics of the Reaction Between Calcium and Water-Vapor. Harry J. Svec and Charles Apel. *Electrochemical Society, Journal*, v. 104, June 1957, p. 346-349.

Calcium was reacted with water vapor in the temperature range 20 to 70 C and at water pressures of 18 to 93 mm. of Hg. The rate constant was linearly dependent on water vapor pressure below 70 C and decreased with increasing temperature in the range 20 to 50 C. At 70 C the rate constant was independent of water vapor pressure.

11387 Electric Moments of Certain Partially Fluorinated Esters. J. B. Romans and T. D. Callinan. *Electrochemical Society, Journal*, v. 104, June 1957, p. 359-365.

All six esters studied were found to be highly polar compounds exhibiting marked tendencies to associate molecularly; they possessed dipole moments of the order of 2.8 to 3.8 x 10^{-18} esu-cm.

11388 Measurement of Ion and Water Transport Across Membranes. J. G. McKelvey, Jr., K. S. Spiegler, and M. R. J. Wyllie. *Electrochemical Society, Journal*, v. 104, June 1957, p. 387-390.

Use of radioactive tracers allows measurement at a constant concentration, without interference from electrode reactions, and with a high degree of precision. Solution concentration is kept constant by adding small amounts of ion-exchange resins to each electrode compartment.

11389 The Bond Orders of Some Conjugated Hydrocarbon Molecules. G. G. Hall. *Faraday Society, Transactions*, v. 53, May 1957, p. 573-581.

The calculation of the molecular orbitals, bond orders and bond lengths of alternant hydrocarbon molecules was programmed for the Cambridge electronic computer (EDSAC). Results are given for a variety of large polycyclic molecules including several carcinogens. Self-consistent bond orders are also calculated to illustrate the changes due to the iteration.

11390 π-Electron Polarizabilities of Some Condensed Aromatic Molecules. Norah V. Cohan, C. A. Coulson, and J. B. Jamieson. *Faraday Society, Transactions*, v. 53, May 1957, p. 582-588.

A formula is provided which enables the π-electron polarizability of a conjugated or aromatic molecule to be expressed in terms of the mutual atom-atom polarizability coefficients π_{rs} of Coulson and Longuet-Higgins. Calculated values for several polynuclear hydrocarbons are in reasonable agreement with experimental values, and it is shown that the introduction of a heteroatom such as nitrogen exerts only a minor influence on the π-electron polarizability.

11391 The Infra-Red Spectrum, Structure, and Normal Vibrations of the Guanidinium Ion. C. L. Angell, N. Sheppard, A. Yamaguchi, T. Shimanouchi, T. Miyazawa, and S. Mizushima. *Faraday Society, Transactions*, v. 53, May 1957, p. 589-600.

The infra-red spectra of guanidinium chloride and iodide and their perdeutero derivatives have been obtained in the region 3600 to 400 cm^{-1}.

11392 Thermodynamic Properties of Methyl Iodide + Chloromethane Solutions. E. A. Moelwyn-Hughes and R. W. Missen. *Faraday Society, Transactions*, v. 53, May 1957, p. 607-615.

The vapor pressures, vapor-liquid equilibria, heats of mixing and molar volumes of binary solutions of CH_3I with CH_2Cl_2, $CHCl_3$, and CCl_4, respectively, have been measured at 25 C. From these, the changes in free energy, entropy and volume which occur on mixing were obtained.

11393 Structure and Viscosity of Melts of Aromatic Hydrocarbons. E. McLaughlin and A. R. Ubbelohde. *Faraday Society, Transactions*, v. 53, May 1957, p. 628-634.

Melting parameters were determined for the molecules triphenylene, pyrene, fluoranthene, 1:2-benzanthracene, and fluorene, none of which appears to "rotate" in the crystalline state.

11394* The System CaO-MnO-CO_2: Solid-Solution and Decomposition Relations. Julian R. Goldsmith and Donald L. Graf. *Geochimica et Cosmochimica Acta*, v. 11, no. 4, 1957, p. 310-334.

A complete series of solid solutions between $CaCO_3$ and $MnCO_3$ exists above 550 C at CO_2 pressures sufficient to prevent decomposition. A solubility gap is observed below this temperature in the Mn-rich half of the system. Experiments were performed dry at elevated temperatures and at CO_2 pressures up to approximately 2,000 atm., and hydrothermally at lower temperatures.

11395 (French.) Spectrographic Study of Complexes Formed by Al Halides and Boron Trifluoride. **Etude spectrographique des complexes formés par les halogénures d'aluminium et le trifluorure de bore. III.** IR Absorption Spectrum and Vapor Pressure of the Addition Compound of Boron and Acetyl Fluorides. **Spectre d'absorption infrarougeet pression de vapeur du composé d'addition des fluorures de bore et d'acétyle.** Bernard P. Susz and Jean-Jacques Wuhrmann. *Helvetica Chimica Acta*, v. 40, no. 3, 1957, p. 722-730.

11396* Polarographic Behaviour of Metals in Ethanolamines. III. Nickel. IV. Cobalt (II). R. S. Subrahmanya. *Indian Academy of Sciences, Proceedings*, v. 45, sec. A, Mar. 1957, p. 184-203 + 4 plates.

Behavior at various pH values and in NaOH, Na_2CO_3, and NH_4Cl-NH_4OH.

11397 Nitric Acid Dissolution of Thorium. Kinetics of Fluoride-Catalyzed Reaction. Robert Lee Moore, C. A. Goodall, J. L. Hepworth, and R. A. Watts, Jr. *Industrial and Engineering Chemistry*, v. 49, May 1957, p. 885-887.

In processing spent reactor fuel, reaction rates for dissolving Th can be correlated with variables by an empirical equation.

11398 Correlation of Interfacial Tension of Two-Phase Three-Component Systems. Nelson F. Murphy, John E. Lastovica, and James G. Fallis. *Industrial and Engineering Chemistry*, v. 49, June 1957, p. 1035-1042.

An equation was developed which permits extrapolation of empirical measurements as a straight-line chart.

11399* Measurement of Transference Numbers in Molten Oxide Mixtures. V. I. Malkin, S. F. Khokhlov, and L. A. Shvartsman. *International Journal of Applied Radiation and Isotopes*, v. 2, Apr. 1957, p. 19-25.

Artificial radioactive isotopes were used to determine the relative mobility of cations in molten oxide mixtures. A method of measuring cation transference numbers was worked out, based on the determination of small changes of concentration in the anolyte.

11400* (Russian.) Investigation on Catalytic Properties of Solid Solutions Based on Nickel Oxide. **Issledovanie kataliticheskikh svoistv tverdykh rastvorov na osnove zakisi nikelia.** N. P. Keier, S. Z. Roginskii, and I. S. Sazonova. *Izvestiia Akademii Nauk SSSR, Seriia Fizicheskaia*, v. 21, Feb. 1957, p. 183-191.

Catalytic properties of solid solutions of NiO having electronic characteristics. The study of triple systems containing oxides of mono- and trivalent metals, gave an indication of the correlation between the electric and catalytic properties of catalysts.

11401 Vapour-Liquid Equilibria of Nitric Acid-Water-Sulphuric Acid Mixtures. S. R. M. Ellis and J. M. Thwaites. *Journal of Applied Chemistry*, v. 7, Apr. 1957, p. 152-160.

11402 An Investigation of Compounds Promoting the Dropwise Condensation of Steam. L. C. F. Blackman, M. J. S. Dewar, and H. Hampson. *Journal of Applied Chemistry*, v. 7, Apr. 1957, p. 160-171.

Preparation and testing of drop-promoters for Cu-containing metal surfaces. Active promoters have in the molecule an unhindered hydrocarbon chain which confers water-repellency on the compound and an "anchoring" group which is usually a divalent S atom.

11403 Effect of Pressure on the Isotope Effect in a Unimolecular Gaseous Reaction: Tritium and Carbon-13 Effects in the Isomerization of Cyclopropane. Ralph E. Weston, Jr. *Journal of Chemical Physics*, v. 26, May 1957, p. 975-983.

11404 Rate Constants of Second-Order Reactions From Kinetic Current Measurements. W. L. Reynolds and Stephen Prager. *Journal of Chemical Physics*, v. 26, May 1957, p. 1006-1009.

Kinetic currents were calculated for the case where the solution contains two electroactive species, one of which may undergo a second order reaction with the reduced form of the other. Results have been applied to the reaction between ferrous versenate and cumene hydroperoxide, assuming the diffusion coefficients of all species to be equal.

11405 Interaction Between Sulfur Dioxide and Polar Molecules. I. Systems Containing Aliphatic Alcohols, Ethers, or Benzene in Carbon Tetrachloride. II. Systems Containing Ethanol, and Benzene or Hydroquinone. III. Water-Ethanol-Sulfur Dioxide and Water-Sulfur Dioxide Systems. P. A. D. de Maine. *Journal of Chemical Physics*, v. 26, May 1957, p. 1036-1056.

11406 Raman Spectrum of Triethylborane. Edmund J. Blau and Barry W. Mulligan. *Journal of Chemical Physics*, v. 26, May 1957, p. 1085-1088.

11407 Infrared Dispersion of Hydrogen Bromide. Bertram Schurin and R. Rollefson. *Journal of Chemical Physics*, v. 26, May 1957, p. 1089-1091.

Values for electric moment and variation of electric moment with internuclear distance are reported as $(0.82 \pm 0.04) \times 10^{-8}$ e.s. μ and $(0.48 \pm 0.04) \times 10^{-10}$ e.s. μ.

11408 Pure Rotational Spectra of the Partially Deuterated Ammonias in the Far Infrared Spectral Region. E. D. Palik and Ely E. Bell. *Journal of Chemical Physics*, v. 26, May 1957, p. 1093-1101.

11409 Vibrational Spectrum of Disilane. George W. Bethke and M. Kent Wilson. *Journal of Chemical Physics*, v. 26, May 1957, p. 1107-1117.

Raman spectra of the liquid and infra-red spectra of the gaseous phase were obtained for Si_2H_6 and Si_2D_6. With the exception of the torsional mode all fundamental frequencies were observed and assigned to the proper normal modes.

11410 Vibrational Spectrum of Borine Carbonyl. George W. Bethke and M. Kent Wilson. *Journal of Chemical Physics*, v. 26, May 1957, p. 1118-1130.

Infra-red spectra of both solid and gaseous BH_3CO, $^{10}BH_3CO$, BD_3CO, and $^{10}BD_3CO$ were obtained.

11411 Mobility and Adsorption of Hydrogen on Tungsten. R. Gomer, R. Wortman, and R. Lundy. *Journal of Chemical Physics*, v. 26, May 1957, p. 1147-1164.

11412 Iodine Complexes in Inert Solvents. II. Complexes of Iodine With Some Aromatic Ethers and Biphenyl in Carbon Tetrachloride. III. Iodine Complexes With Methanol, Ethanol, or Diethyl Ether in Carbon Tetrachloride. VI. Solvation Processes in Solutions of Oxygenated Solvents and Iodine, Bromine, or Sulfur Dioxide. P. A. D. de Maine. *Journal of Chemical Physics*, v. 26, May 1957, p. 1189-1204.

11413 Thermodynamics of the Zr-ZrO_2 System. The Dissociation Energies of ZrO and ZrO_2. W. A. Chupka, J. Berkowitz, and Mark G. Inghram. *Journal of Chemical Physics*, v. 26, May 1957, p. 1207-1210.

Values of 7.8 ± 0.2 e.v. and 14.5 ± 0.2 e.v. were found for ZrO and ZrO_2, respectively.

11414 Integrated Rate Equations of Isotopic Exchange in Simple Reversible Reactions. Robert A. Alberty and Wilmer G. Miller. *Journal of Chemical Physics*, v. 26, May 1957, p. 1231-1237.

Equations are given for various mechanisms by which three substances may be interconverted by first-order reactions.

11415 Studies of I Atom and Br Atom Recombination Following Flash Photolysis of Gaseous I_2 and Br_2. R. L. Strong, J. C. W. Chien, P. E. Graf, and J. E. Willard. *Journal of Chemical Physics*, v. 26, May 1957, p. 1287-1295.

Flash photolysis was used to determine the rate constant k, in the expression $d(X_2)/dt = k(X)^2M$ for the combination of I atoms in A, and of Br atoms in A, O, and N.

11416 Fluorescence Efficiencies of Organic Compounds. Milton Furst, Hartmut Kallmann, and Felix H. Brown. *Journal of Chemical Physics*, v. 26, May 1957, p. 1321-1332.

Gives data on 334 compounds.

11417 Radiolysis of Mixtures: Cyclohexane-Benzene-Iodine. Milton Burton, J. Chang, S. Lipsky, and M. P. Reddy. *Journal of Chemical Physics*, v. 26, May 1957, p. 1337-1338.

Work on radiolysis of pure cyclohexane by Co^{60} gammas, shows that I decreases the yield of H_2 to a value of about 3.8 at $[I_2] = 10^{-3}M$. Addition of benzene to such a solution would result in a further decrease in yield.

11418 (French.) Dissociation Energy of Hydrocarbides. **L'énergie de dissociation des hydrocarbures.** W. Heitler. *Journal de Chimie Physique*, v. 54, Apr. 1957, p. 265-268.

A method, based on mesomerism, for a semi-empirical calculation of dissociation energies is applied to simple molecules (CH_4, C_2H_2, etc.) and to free radicals (CH_3, C_2H, etc.). Calculated results agreed with experimental data.

11419 (French.) Dissociation of Organic Acids Having a Long Linear Chain. **La dissociation des diacides organiques a chaine linéaire longue.** Marie Louise Dondon. *Journal de Chimie Physique*, v. 54, Apr. 1957, p. 290-303.

A study of the dissociation constants of the C_4 to C_{12} and also the C_{22} linear diacids in water-methanol, water-ethanol, and water-dioxane systems. Determination of ionization and dielectric constants, and chain length in a given solvent.

11420 The Theory of the Electric Charge Distribution of Monodispersed Lightly Charged Aerosols of Spherical Particles Coagulating in a Bipolar Ionized Atmosphere. George Luchak. *Journal of Colloid Science*, v. 12, Apr. 1957, p. 144-160.

11421 The Conductimetric Behaviour in Nonaqueous Solvents of Organometallic Chlorides From Group IVB. Alvin B. Thomas and Eugene G. Rochow. *Journal of Inorganic and Nuclear Chemistry*, v. 4, nos. 3-4, 1957, p. 205-215.

11422 Vibrational Frequencies of Isatin Oximes. D. G. O'Sullivan and P. W. Sadler. *Journal of Organic Chemistry*, v. 22, Mar. 1957, p. 283-286.

Comparatively large shifts in the α-carbonyl group stretching frequencies occur with variation in ring substituents similar to the shifts observed with substituted oxindoles and with substituted acetanilides in the solid state.

11423 Stereochemistry of Some Lithium Aluminum Deuteride Reductions. G. K. Helmkamp and B. F. Rickborn. *Journal of Organic Chemistry*, v. 22, May 1957, p. 479-482.

The reduction of sulfonates and halides with lithium aluminum hydride involves inversion of configuration.

11424 A Quantitative Treatment for Electrophilic Reactions of Aromatic Derivatives. Y. Okamoto and Herbert C. Brown. *Journal of Organic Chemistry*, v. 22, May 1957, p. 485-494.

Utility of the σ^+ constants in extending the Hammett treatment to provide a quantitative correlation of aromatic substitution and other electrophilic reactions.

11425 The Compressibilities of the Silicates: The Li_2O-SiO_2 System. Harry Bloom and John O'M. Bockris. *Journal of Physical Chemistry*, v. 61, May 1957, p. 515-518.

Two models for the liquid silicates indicate different courses for the compressibility isotherms as a function of composition. Compressibilities were measured over the composition range 24-55% Li_2O.

11426 Homogeneous Decomposition of Hydrogen Peroxide Vapor. Charles N. Satterfield and Theodore W. Stein. *Journal of Physical Chemistry*, v. 61, May 1957, p. 537-540.

Studies of thermal decomposition under flow conditions in a relatively inert glass reactor show a transition from heterogeneous to homogeneous reaction in the temperature range of 400 to 450 C, at a partial pressure of 0.02 atmosphere. The homogeneous reaction was of 3/2 order and had an activation energy of 55,000 cal.

11427 Physico-Chemical Properties of Solutions of *Para* Long Chain Alkylbenzenesulfonates. Jacqueline Wise Gershman. *Journal of Physical Chemistry*, v. 61, May 1957, p. 581-584.

Solubilities, conductance, and surface tension data.

11428 The Sodium Diffusion Flame Method for Fast Reactions. II. Reactions of Fluorinated Methyl Chlorides. John F. Reed and B. S. Rabinovitch. *Journal of Physical Chemistry*, v. 61, May 1957, p. 598-605.

Reaction of Na atoms with the series CH_3Cl_2, CFH_2Cl, CF_2HCl, and CF_3Cl.

11429 The Heats of Adsorption of Helium and Neon on Graphitized Carbon Black. J. Greyson and J. G. Aston. *Journal of Physical Chemistry*, v. 61, May 1957, p. 610-613.

The partial molal heats of adsorption of He at 17.3 K on graphitized carbon were measured and also calculated from isotherms interpolated to 17.0 and 20.3 K from measured data. Values for neon at 29 K were likewise measured and also calculated from isotherms interpolated to 28 and 30 K.

11430 Thermoluminescence Studies of Aluminum Oxide. James K. Rieke and Farrington Daniels. *Journal of Physical Chemistry*, v. 61, May 1957, p. 629-633.

Gamma-ray induced thermoluminescence of Al oxides depends on the extent of hydration and the crystal form produced by different calcining treatments. A peak at 236 C depends on Na impurity. Surface thermoluminescence can be induced by visible light in partially hydrated alumina.

11431 Thermoluminescence of Some Inorganic Crystals and Glasses. James K. Rieke. *Journal of Physical Chemistry*, v. 61, May 1957, p. 633-635.

Over 50 inorganic compounds and glasses were examined for γ-ray induced thermoluminescence.

11432 Thermoluminescence of Sodium Sulfate and Lead Sulfate and Miscellaneous Sulfates, Carbonates, and Oxides. Louise E. Moore. *Journal of Physical Chemistry*, v. 61, May 1957, p. 636-639.

Radiation-induced thermoluminescence of Na_2So_4 is affected by the method of dehydration and by the impurities taken up on crystallization. Lead sulfate is not thermoluminescent, but is rendered so by the addition of certain impurity ions.

11433 Nitric Oxide Decomposition at 2200-2400° K. C. P. Fenimore and G. W. Jones. *Journal of Physical Chemistry*, v. 61, May 1957, p. 654-657.

Flat premixed flames of N_2O and fuel are burned at controlled temperatures on a water cooled porous burner. The N_2O decomposes entirely in the flame, partly to NO and the subsequent decay of NO in the burned gas downstream of the flame is observed by probe sampling.

11434 Conductance of Unassociated Electrolytes. Raymond M. Fuoss and Lars Onsager. *Journal of Physical Chemistry*, v. 61, May 1957, p. 668-682.

The relaxation field for unassociated electrolytes is obtained as a function of concentration by solving the Onsager-Fuoss equation of continuity, subject to boundary conditions for charged spheres to represent the ions, and with retention of higher order terms.

11435 Kinetics of Graphite Oxidation. George Blyholder and Henry Eyring. *Journal of Physical Chemistry*, v. 61, May 1957, p. 682-688.

Details of apparatus for studying heterogeneous gas-solid reactions in the 1 to 100μ pressure and 600 to 1300 C temperature range. Data for the graphite-oxygen reaction from 600 to 800 C.

11436 Lattice Constants of Potassium Bromide-Potassium Iodide Solid Solutions. Eugene T. Teatum and Norman O. Smith. *Journal of Physical Chemistry*, v. 61, May 1957, p. 697-698.

Measurements show the variation of lattice constant with composition, at room temperature. Lattice constants found for KBr and KI are 6.599 and 7.059 A respectively.

11437 The Periodate Oxidation of *cis*- and *trans*-Cyclopentanediol-1,2. Vernon C. Bulgrin. *Journal of Physical Chemistry*, v. 61, May 1957, p. 702-704.

The rate of oxidation of the *cis*-isomer was so rapid at zero C that only pseudo second-order rate constants could be obtained. Graphs show the pseudo first-order rate constants for the *trans*-isomer.

11438* Thermal Conductivity of Nitrogen From 50° to 500°C and 1 to 100 Atmospheres. R. L. Nuttall and D. C. Ginnings. *Journal of Research, National Bureau of Standards*, v. 58, May 1957, p. 271-278.

The parallel-plate method was used with a spacing of about 0.5 mm. between the hotplate and coldplate.

11439* High Pressure Vapour-Liquid Equilibria of Non-Ideal Solutions—Benzene-Methanol System. V. N. Kumarkrishna Rao, K. J. R. Sarma, D. R. Swami, and M. Narasinga Rao. *Journal of Scientific & Industrial Research*, v. 16B, Jan. 1957, p. 4-12.

Studies were carried out under pressures up to 270 psi. in a liquid recirculatory type of still designed and fabricated to withstand high pressures. The shift of azeotrope with pressure is correlated in an empirical procedure.

11440* Studies in the Properties of Capillary-Held Liquids. I. An Apparatus for Determining Freezing & Boiling Points for Capillary Condensates. Balwant Rai Puri and Y. P. Myer. *Journal of Scientific & Industrial Research*, v. 16B, Feb. 1957, p. 52-57.

Gives results obtained with benzene and water adsorbed on silica gel and bentonite at different relative vapor pressures.

11441* Ternary Liquid Equilibria. G. Jaya Rama Rao and C. Venkata Rao. *Journal of Scientific & Industrial Research*, v. 16B, Mar. 1957, p. 102-104.

Liquid-liquid equilibrium data on the distribution of formic, acetic, propionic, and butyric acids, in the two-phase system ethyl benzoate-water.

11442 Reversible Configurational Changes in Poly-L-Lysine Hydrochloride Induced by Water. E. R. Blout, H. Lenormant, A. Elliott, B. R. Malcolm, and W. E. Hanby. *Nature*, v. 179, May 11, 1957, p. 960-963.

11443 Ratios of Specific Heat and High-Frequency Viscosities in Organic Liquids Under Pressure, Derived From Ultrasonic Propagation. E. G. Richardson and R. I. Tait. *Philosophical Magazine*, v. 2, ser. 8, Apr. 1957, p. 441-454.

Measurements of the velocity and attenuation of plane sound waves in a number of organic liquids at pressures up to 10,000 psi. The ratio of specific heats was calculated as a function of pressure.

11444 The Thermal and Magnetic Properties of Neodymium Ethylsulphate at Low Temperatures. Horst Meyer. *Philosophical Magazine*, v. 2, ser. 8, Apr. 1957, p. 521-533.

Entropy, specific heat, and absolute temperature were determined as a function of the magnetic temperature for a single crystal in the temperature range between 0.015 and 1K by adiabatic demagnetization experiments.

11445 (English.) **The Flow Properties of Pure ^{4}He and of ^{3}He-^{4}He Mixtures at Temperatures Below the Lambda-Point.** D. H. N. Wansink and K. W. Taconis. *Physica*, v. 23, Apr. 1957, p. 273-305.

Flow through a slit with a width of 0.3μ was studied as a function of hydrostatic pressure heads up to 7000 cm. He and fountain pressure differences up to 2500 cm. He. Flow resistance is proportional to the slit length.

11446 (English.) **Some Properties of Liquid Sulfur and the Occurrence of Long Chain Molecules.** J. Schenk. *Physica*, v. 23, Apr. 1957, p. 325-337.

Some properties, especially the viscosity, show an abrupt change at 160 C which is attributed to a change of ring molecules S_8 into very long chain molecules S_n.

11447 Hydrodynamics of Oscillating Disks in Viscous Fluids: Viscosities of Liquids He^3 and He^4. R. Dean Taylor and J. G. Dash. *Physical Review*, v. 106, ser. 2, May 1, 1957, p. 398-403.

The viscosity of liquid He^3 rises as the temperature decreases from a value of 18.7 micropoise at 3.35 K to 26.8 micropoise at 1.3 K.

11448 Electron-Bombardment-Induced Dissociation of Alkaline Earth Oxides. P. Wargo and W. G. Shepherd. *Physical Review*, v. 106, ser. 2, May 15, 1957, p. 694-703.

The oxygen evolution induced by electron bombardment was observed by means of an omegatron mass spectrometer. Thres hold energies for the process were determined as 9.5±0.5 e.v., 14.0±0.5 e.v., and 16.9±0.5 e.v. for BaO, SrO, and MgO respectively.

11449* (English.) **Crystal Structure and Phase Transition of Some Metallic Halides. IV. On the Anomalous Structure of α-AgI.** Sadao Hoshino. *Physical Society of Japan, Journal*, v. 12, Apr. 1957, p. 315-326.

Structure was studied by thermal and X-ray methods.

11450 Quantum Chemistry. An Introduction. Walter Kauzmann. 744 p. 1957. Academic Press, New York. (QD453 K16q)

Mathematical background; general principles of quantum mechanics; atomic systems; molecular systems; systems in non-stationary states.

11451* The Oxidation of Ferrous Ammonium Sulfate Solutions by Electron Irradiation at High Dose Rates. J. P. Keene. *Radiation Research*, v. 6, Apr. 1957, p. 424-429.

The 100-e.v. yield for the oxidation of 3×10^{-3} *M* air-saturated ferrous ammonium sulfate solution in 0.8 *N*. H_2SO_4 by 4-m.e.v. electrons was measured at a dose rate of about 10^{16} rads per sec., resulting in a mean value of 14.3.

11452* (English.) **The Electrolysis of Some 3-Arylpropionic Acids. Isomerization of Free Radicals.** H. Breederveld and E. C. Kooyman. *Recueil des Travaux Chimiques des Pays-Bas*, v. 76, Apr. 1957, p. 297-312.

Studies with a view to a possible rearrangement of free radicals formed through discharge of anions.

11453* (English.) **Steric Effects on Mesomerism. XV. Comparative Investigations Involving Ultra-Violet Absorption Spectra, Molecular Refractions, Basic Strengths, and Rates of Reaction of Derivatives of Nitrobenzene. XVI. Comparative Investigations Involving Ultra-Violet Absorption Spectra, Molecular Refractions, Rates of Reaction, and Basic Strengths of Aromatic Amines.** B. M. Wepster. *Recueil des Travaux Chimiques des Pays-Bas*, v. 76, Apr. 1957, p. 335-389.

11454 Apparatus for the Measurement of Vapor Pressure and Ignition of Decomposition Temperature at Pressures Above Atmospheric. A. Greenville Whittaker. *Review of Scientific Instruments*, v. 28, May 1957, p. 360-364.

Includes vapor pressure data on ethyl nitrate and 2-nitropropane, also data on the decomposition temperature of triethyleneglycol dinitrate, metriol trinitratetriacetin and gem-dinitropropane.

11455 (French.) Evolution of the Surface Tension Properties Conferred by Various Wetting Agents. **Évolution des caractéristiques tensio-actives conférées par divers agents mouillants.** C. Labbe. *Revue de l'Institut Français de Pétrole et Annales des Combustibles Liquides*, v. 12, Feb. 1957, p. 185-206.

Classification of wetting agents, considering their specific properties and behavior in various media. Influence of temperature and pressure.

11456 Two-Phase Equilibrium in Binary and Ternary Systems. X. Phase Equilibria and Compressibility of the Systems Carbon Dioxide/Propylene, Carbon Dioxide/Ethylene and Ethylene/Propylene, and an Account of the Thermodynamic Functions of the System Carbon Dioxide/Propylene. G. G. Haselden, F. A. Holland, M. B. King, and R. F. Strickland-Constable. *Royal Society Proceedings*, v. 240, ser. A, Apr. 24, 1957, p. 1-28.

11457 Dielectric Relaxation, Viscosity and Freezing. Nora E. Hill. *Royal Society, Proceedings*, v. 240, ser. A, Apr. 24, 1957, p. 101-107.

Polar liquids may be divided into two classes according to whether or not the rotation of the dipoles is prevented by solidification.

11458* Melting and Crystal Structure of Cryolite ($3NaF \cdot AlF_3$). G. J. Landon and A. R. Ubbelohde. *Royal Society, Proceedings* v. 240, ser. A, May 21, 1957, p. 160-172.

Methods of studying electrical conductances in solid and melt for Na_3AlF_6 and NaF which melt at 1013·5 and 997 C respectively.

11459 Surface Kinetics. H. Austin Taylor. v. XII. 18 p. 1956. University of Notre Dame Press, Notre Dame. (QD506 T21s)

The mechanism of chemisorption and its application to surface reactions.

11460* (English.) **Chemical Applications of High Resolution Nuclear Magnetic Resonance.** James N. Shoolery. *Svensk Kemisk Tidskrift*, v. 69, no. 4, 1957, p. 185-198.

Basic theory; interaction of the nucleus with its environment; instrumental parameters; solutions of chemical problems such as organic structure determinations, location and measurement of deuterium substitution, and H bonding in small and large molecules.

11461* (English.) **Sedimentation Velocity Investigations on Concentrated Viscose (Cellulose Xanthate) Solutions.** Stig Claesson and Henrik H. Bruun. *Svensk Papperstidning*, v. 60, May 15, 1957, p. 336-340.

11462 Absorption Spectrum of the SO Molecule. William T. Hicks. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-3697, Feb. 1957, 16 p. (UF767 U3u Contin.)

11463 Vapor-Liquid Equilibrium Data. Ju Chin Chu, Shu Lung Wang, Sherman L. Levy, and Rajendra Paul. 754 p. 1956. J. W. Edwards, Ann Arbor, Michigan. (TP156.D5 C47v)

Contains data on 466 systems published to June, 1954.

11464* (German.) Infrared Spectroscopic Tests on Mercury Hydrazine Halides. **Infrarotspektroskopische Untersuchung von Quecksilber(11)-Hydrazin-halogeniden.** Klaus Brodersen. *Zeitschrift für Anorganische und Allgemeine Chemie*, v. 290, Apr. 1957, p. 24-34.

Attempt is made to ascertain the space allocation of NH_2 groups of the hydrazine molecule from infrared spectra of the addition compounds $[Hg(N_2H_4)_2]Cl_2$, $[Hg(N_2H_4)]Cl_2$, and $[Hg(N_2H_4)]Br_2$. The trans-form is considered as non-existent.

See also: **11112** (kinetics of ethyl alcohol-lactic acid reaction); **11138** (structure of cyclobutene); **11176** (infrared spectra of polychlorobenzenes); **11318** (structure of malanthin); **11560** (free energy of formation of PbS, CoO, NiO, and Cu_2O); **11786** (thixotropy theory); **11859** (dissolution of W in HNO_3 and HF); **12150** (properties of polyphenyls); **12252** (properties of ferrites); **12345** (filtration of aerosols).

COATINGS

11465 Reactions of Unsaturated Fatty Alcohols. II. Polymerization of Vinyl Ethers and Film Properties of Polymers. W. J. Schneider, L. E. Gast, E. H. Melvin, C. A. Glass, and H. M. Teeter. *American Oil Chemists' Society, Journal*, v. 34, May 1957, p. 244-247.

Vinyl ethers of stearyl, soybean, and linseed fatty alcohols were prepared and polymerized in solution in hydrocarbon or chlorinated solvents at temperatures down to −30 C with several Lewis-acid-type catalysts.

11466* (German.) Effect of Cadmium Content on Attack of Zinc Melts on Iron. **Der Angriff kadmiumhaltiger Zinkschmelzen auf Eisen.** Dietrich Horstmann. *Archiv für das Eisenhüttenwesen*, v. 28, Apr. 1957, p. 195-199.

Determination of Fe loss. Growth of the Fe-Zn alloy layers. Relationship between time, temperature, and the attack of Cd-containing Zn melts.

11467 Vacuum-Deposited Films of Nickel-Chromium Alloy. R. H. Alderson and F. Ashworth. *British Journal of Applied Physics*, v. 8, May 1957, p. 205-210.

Preparation and properties, including film-alloy composition, relationship between film thickness and resistance, temperature coefficient of resistance, grain size in the film, mechanical failure of stressed films, optical transmission as a function of film thickness, fundamental noise, and electrical breakdown under low- and high-frequency conditions.

11468* (German.) Oxidation and Film-Formation of Drying Oils. **Oxydation und Verfilmung trocknender Öle.** H. P. Kaufmann. *Fette, Seifen, Anstrichmittel*, v. 59, Mar. 1957, p. 153-162.

Processes in action during autoxidation and film-formation at normal temperature with and without additives; the possibility of acceleration of oxidation and film-forming of drying oils.

11469* (German.) Scientific and Technical Problems in the Field of Siccatives. **Über wissenschaftliche und technische Probleme auf dem Sikkativ-Gebiet.** J. Bakker. *Fette, Seifen, Anstrichmittel*, v. 59, Mar. 1957, p. 170-173.

Differences in the drying of linseed oil and tung oil and the influence of driers and antiskinning agents.

11470* Swelling of Paint Films in Water. X. Rate of Penetration of Water, Permeability to Water Vapor, and Penetrability to Air in Relation to Water Absorption. F. L. Browne. *Forest Products Journal*, v. 7, Apr. 1957, p. 145-154.

11471* Drying Paint With Gas. B. C. Von Esch. *Gas*, v. 33, June 1957, p. 61-66.

Types of finishes; methods of heat transfer; types of drying; oven design and operating characteristics; some field problems and suggested solutions.

11472* Vacuum Metallising. Derek J. T. Kennedy. *Industrial Finishing*, v. 9, May 1957, p. 554-559.

Principles and equipment, including the system of pumping and plant maintenance. Applications.

11473* A Survey of Chromate Treatments. Walter E. Pocock. *Industrial Finishing*, v. 9, May 1957, p. 561 + 5 pages.

Treatments for Zn, Cd, Cu, Al, and Mg are considered.

11474 Polyamide Protective Coatings. Don E. Floyd. *Materials & Methods*, v. 45, May 1957, p. 136-139.

Polyamide resin films can be used to protect metals or plastics from abrasion, heat, water, grease, acids, and alkalies.

11475 Surface Treatment and Finishing of Light Metals. XII-E. Plating on Aluminum—Hard Chromium and Non-Electrolytic Deposits. S. Wernick and R. Pinner. *Metal Finishing*, v. 55, May 1957, p. 55 + 5 pages.

Chemical etching; Cr plating; Sn immersion deposits; immersion Ag deposit; chemical Ni plating.

11476 The Surface Metallurgy of Protective Coatings. Charles L. Faust. *Metal Progress*, v. 71, May 1957, p. 101-106.

Protective alloy coatings for high-temperature service are made by plating alternate layers of the metals and then alloying by a diffusion heat treatment. Results are often affected by the surface conditions of the basis metal. Rapid diffusion alloying of basis metal and coating and diffusion through the coating may sometimes be stopped by an intermediate barrier layer or thin plate of a third, slowly diffusing metal.

11477* A Systematic Study of PE-Ethylene Glycol Blends in Oxidizing Alkyds. John P. Landig, Conrad J. Campbell, Raymond P. Silver, and Victor J. Larson. *Official Digest. Federation of Paint and Varnish Production Clubs*, v. 29, May 1957, p. 453-475.

With polyol blends it is possible to obtain commercially useful alkyds of satisfactory acid number and viscosity by varying the per cent fatty acids and/or the maleic modification.

11478* Some Metallic Soaps Used in the Protective Coatings Industry. Francis J. Licata. *Official Digest. Federation of Paint and Varnish Production Clubs*, v. 29, May 1957, p. 485-491.

Manufacture, properties, and applications.

11479 The Action of Solvents on Drying-Oil Films. I. N. Stolow. *Oil & Colour Chemists' Association, Journal*, v. 40, May 1957, p. 377-402.

Data on leaching and swelling of linseed oil films in various solvents.

11480* The Modern Chlorate - Accelerated Phosphating Bath. Edward Heinzelman, Jr. *Organic Finishing*, v. 18, May 1957, p. 8-11.

Chlorate- and nitrate-accelerated baths are compared. Accelerator action, function of oxidizing agents, and corrosion characteristics are considered.

11481* Pearl Essence—Dispersions, Formulae and Applications. William E. Decker. *Organic Finishing*, v. 18, May 1957, p. 12-14.

11482* Outdoor Exposure of Acrylic Emulsion Paints. I. Results of Outdoor Exposure on Panels. Gerould Allyn. *Paint and Varnish Production*, v. 47, May 1957, p. 39 + 4 pages.

Paint formulations and exposure characteristics.

11483* Pigment Colors for Paint. III. Reds and Greens. George Wormald. *Paint and Varnish Production*, v. 47, May 1957, p. 43-49.

Pigment properties, advantages, and disadvantages.

11484* Modified Vinyl Acetate Emulsion Copolymers. *Paint and Varnish Production*, v. 47, May 1957, p. 50 + 6 pages.

Dibutyl fumarate and dibutyl maleate as comonomers impart improved properties to PVAc emulsions.

11485 Characteristics of Chlorinated-Rubber-Based Finishes. R. D. Ullrich. *Products Finishing*, v. 21, May 1957, p. 68-74.

Advantages of finishes based on Parlon chlorinated rubber include chemical resistance, drying speed, hardness, outdoor durability, good adhesion to metal, and high solids content.

11486 A Survey of Paint Application Methods. III. Hot Spray; Airless Spraying; Steam Spray Painting; Spraying Catalyst Coatings. Ezra A. Blount. *Products Finishing*, v. 21, June 1957, p. 66-76.

Techniques and equipment.

11487* Rubbery Copolymers From Unsaturated Ketones. W. Cooper, T. B. Bird, and E. Catterall. *Rubber Chemistry and Technology*, v. 30, Jan.-Mar. 1957, p. 296-314.

Preparation and properties of copolymers from unsaturated ketones with acrylate esters and with butadiene, with details of the polymerization reactions and structure of the copolymers.

11488 Some Aspects of Electrophoretic Deposition. Gilbert F. Kinney and John V. Festa. *Sylvania Technologist*, v. 10, Apr. 1957, p. 48-52.

A deposit of Al_2O_3 is described with regard to suspension, composition, equipment required, and nature of the deposits obtained.

11489 Unitane Titanium Dioxide Pigments. Their Properties and Industrial Applications. 317 p. 1956. American Cyanamid Co., New York. (TP936 Am35u)

Manufacture of TiO_2; chemical and physical properties of TiO_2 as a pigmenting material; major application characteristics that contribute tinting value, hiding power, color, durability, and other properties to pigmented compositions; industrial applications; specifications and test methods.

11490* (Russian.) Copper Oxidation in Aqueous Solutions of Potassium Bichromate and Sulfuric Acid. **Ob okislenii medi v vodnykh rastvorakh bikhromat kaliia-sernaia kislota.** N. N. Miliutin and A. I. Shultin. *Zhurnal Prikladnoi Khimii*, v. 30, Mar. 1957, p. 346-352.

See also: **11562** (coatings for military equipment); **11605** (coatings for printed circuits); **11898** (conversion coatings for Al); **11962** (domain patterns on metal films); **11973** (properties of Cr films); **12057** (evaporated metal films); **12061** (properties of Ba films); **12063** (structure of Zn coatings); **12302** (emulsion polymers).

CONTROL SYSTEMS, COMPUTERS, AND SYSTEMS ENGINEERING

11491 What's Holding Back the Automatic Assembly Machine? George H. Kendall, Sr., Jerry A. Host, and George H. Kendall, Jr. *American Machinist*, v. 101, May 6, 1957, p. 129-140.

With an engineered line of standardized tooling attachments, the automatic assembly or automatic sequence-machining unit will move into metalworking in a big way.

11492 The Application of an Analog Computer to the Measurement of Process Dynamics. P. E. A. Cowley. *ASME, Transactions*, v. 79, May 1957, p. 823-832.

11493 A Graphical Method for the Analysis of Piecewise Linear Control Systems, With Particular Application to Relay Controls. R. H. Macmillan. *ASME, Transactions*, v. 79, May 1957, p. 841-852.

11494 Analysis and Design of a Servomotor Operating on High-Pressure Compressed Gas. Gerhard Reethof. *ASME, Transactions*, v. 79, May 1957, p. 875-885.

Pneumatic servomotor is suitable for aircraft and missile applications.

11495* Programme Design for the C.S.I.R.O. Mark I Computer. IV. Automatic Programming by Simple Compiler Techniques. G. W. Hill and T. Pearcey. *Australian Journal of Physics*, v. 10, Mar. 1957, p. 137-161.

11496* How Proportional Plus Integral Control Stabilizes. David A. Lieberman. *Automation*, v. 4, June 1957, p. 77-84.

Describes various elementary controllers and a more satisfactory, complex mode of control.

11497 Automation in Business and Industry. Eugene M. Grabbe, editor. 611 p. 1957. John Wiley & Sons, New York. (TJ213 G75a)

Papers cover fundamentals, components, and applications of computers, data processing machines, and automatic manufacturing equipment.

11498 Automation, Its Impact on Economic Growth and Stability. Almarin Phillips. 36 p. 1957. American Enterprise Assn., Washington, D. C. (HD45 P54a)

Analysis of the impact of automation on the economy and its implications for national policy concludes that it is a creator of employment opportunities and increased well-being, not a destroyer of prosperity.

11499* A Versatile Analogue Computer. R. J. A. Paul. *Automation Progress*, v. 2, May 1957, p. 204 + 4 pages.

Description and operation.

11500* (Russian.) Correction of Control and Regulation Pulse Systems. **Korrektsiia impul'snykh sistem regulirovaniia i upravleniia.** Ia. Z. Tsypkin. *Avtomatika i Telemekhanika*, v. 18, Feb. 1957, p. 111-125.

Continuous and pulse correction methods. Technique of calculation of correction elements. The possibility of employing digital computers as correction elements.

11501* (Russian.) A Method for Synthesis of Computing and Controlling Contact Circuits. **Metod sinteza vychislitel'nykh i upravliaiushchikh kontaktnykh skhem.** G. N. Povarov. *Avtomatika i Telemekhanika*, v. 18, Feb. 1957, p. 145-162.

New cascade method offers the designer a concise step-by-step procedure resulting in considerable time saving and circuitry reduction.

11502* (Russian.) Stable Operation of a Two-Phase Asynchronous Servomotor With Negative Speed Feedback. **Ustoichivost' raboty dvukhfaznogo servodvigatelia s otritsatel'noi obratnoi sviaz'iu po skorosti.** E. I. Slepooshkin. *Avtomatika i Telemekhanika*, v. 18, Feb. 1957, p. 163-173.

Criteria for stable operation are stated. Parameters of the negative feedback are defined through parameters of mechanical characteristics at the starting point.

11503 Converting Automatic Ticketing to Automatic Message Accounting. W. R. Baldinger. *Bell Laboratories Record*, v. 35, May 1957, p. 184-187.

11504 An Electrically Operated Hydraulic Control Valve. J. W. Schaefer. *Bell System Technical Journal*, v. 36, May 1957, p. 711-736.

Details of electrohydraulic transducer used in servos that drive the control surfaces of the NIKE missile.

11505* An Introduction to Automatic Electronic Computing for Engineering Calculations. B. J. Kaganov. *Canadian Aeronautical Journal*, v. 3, May 1957, p. 155-160.

Historical background and basic operations.

11506 Fitting the Digital Computer Into Process Control. Montgomery Phister Jr. and Eugene M. Grabbe. *Control Engineering*, v. 4, June 1957, p. 129-136.

A systematic approach to analysis and synthesis; a case-history study of a typical design project.

11507* Mechanical Design Considerations for Automatic Control. L. U. C. Kelling and G. L. Rogers. *Electrical Manufacturing*, v. 59, May 1957, p. 132-135.

11508* Transistor Magnetic Amplifier for Power Motor Control. S. Weissman and M. Bracutt. *Electrical Manufacturing*, v. 59, June 1957, p. 157-163.

Position or velocity command control of an integral-horsepower d.c. servo motor can be obtained with the "Magnemax" system which takes low-level signals through a transistor preamplifier and a transistor magnetic amplifier. The latter governs field control and also armature control through a power saturable reactor.

11509 Shock Design. Charles E. Crede. *Electronic Industries & Tele-Tech*, v. 16, May 1957, p. 62 + 3 pages.

An analog computer can be used to help select isolator characteristics for different applications involving shock or vibration. Recordings of actual environmental conditions drive an analog function generator for the analysis.

11510* Application of the Analog Computer to Engineering Problems. Walter Noon. *General Motors Engineering Journal*, v. 4, Apr.-May-June, 1957, p. 34-37.

How the computer assists in the evaluation of proposed mechanical, electronic, hydraulic, and pneumatic designs.

11511 Binary Data Transmission Techniques for Linear Systems. M. L. Doelz, E. T. Heald, and D. L. Martin. *I.R.E., Proceedings*, v. 45, May 1957, p. 656-661.

11512* A Thermionic Rheostat for Automatic Control. E. G. Hopkins. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. A, Apr. 1957, p. 180-184.

Spacing between the two thermionic cathodes is controlled by rotating the valve while one cathode is held stationary by means of an external permanent magnet.

11513 Digital Automation. XIX. Engineering Problems. Martin L. Klein, Frank K. Williams, and Harry C. Morgan. *Instruments and Automation*, v. 30, May 1957, p. 889-890.

Eight steps in a simple program for evaluating a polynomial on a general-purpose digital computer.

11514 New Techniques for Analog Computation. Horton E. Harris. *Instruments and Automation*, v. 30, May 1957, p. 894-899.

The newest techniques include problem check, time-scale check, voltage-scale check, patchbay verifiers, pot-loading turrets, patchbay switching, automatic recording, and a complete Auto-Control system for setting potentiometers, reading the settings, measuring voltages, and operating the computer.

11515 The Use of Digital Computing Equipment for Processing Neutron Cross-Section Data. E. L. Morgan, M. L. Yeater, and N. D. Scheib. *Knolls Atomic Power Laboratory (U. S. Atomic Energy Commission)*, KAPL-1638, Feb. 1957, 20 p. (UF767 Un3.1ka Contin.)

Typical applications; punched card preparation; machine computations; plotting computed data.

11516 How to Plan for Accurate Communication in Man-Machine Systems. Richard Coburn. *Machine Design*, v. 29, May 16, 1957, p. 110-114.

Principles of control-display arrangement and panel layout for accurate communication between machines and their operators.

11517 Methods of Improving Servo System Performance. I. J. M. Nightingale. *Machine Design*, v. 29, May 30, 1957, p. 76-83.

Methods for combatting shortcomings of closed-loop systems. Stability improvement, proportional-plus-derivative action, proportional-plus-integral action, three-term control action.

11518* Features of the Cryotron. *Mechanical World and Engineering Record*, v. 137, May 1957, p. 226-228.

The cryotron, a device comparable in action with, but faster in operation than an electro-mechanical relay, is finding a wide application in computer circuits and could have many other applications.

11519 Modern Digital Techniques. Milton H. Aronson and Martin L. Klein. *Military Automation*, v. 1, Mar.-Apr. 1957, p. 86-92.

Application in multiplexing, counting, binary addition, and multiplying.

11520 The Analog Computer. II. Robert L. Yeager. *Military Automation*, v. 1, Mar.-Apr. 1957, p. 102-105.

Shows how analog computers are programmed to accomplish simulation of electromechanical and aerodynamic mechanisms.

11521 Analog and Digital Computers in Nuclear Engineering. *Nucleonics*, v. 15, May 1957, p. 53-88.

Role of computers in nuclear design; control analysis with a digital computer; Monte Carlo method in reactor problems; PWR training simulator; analog study of boiler-reactor interaction; dynamic simulation of a fast reactor.

11522 Principles of Computer Simulators. 150 p. 1957. U. S. Naval Training Device Center, Port Washington, New York. (QA76 Un3.5p)

The analog computer-simulator; mathematics and motion; computer servomechanisms; vacuum tube circuits in analog computers; mathematical operations with computers; components; maintenance.

11523* Automation. Gordon S. Brown. *Technology Review*, v. 59, May 1957, p. 359 + 8 pages.

Robotry is regarded not as another industrial revolution, but as a demonstration of man's effective cooperation with nature.

See also: **10961** (aircraft power control system simulator); **11097** (chemical process control equipment); **11105** (analog computer for chemical process-control problems); **11537** (computer study of electrical machines); **12155** (electrical analog of a reactor).

ELECTRICAL ENGINEERING

11524 Testing of Foil-Clad Laminates for Printed Circuitry. T. D. Schlabach, E. E. Wright, A. P. Broyer, and D. K. Rider. *ASTM Bulletin*, no. 222, May 1957, p. TP93-TP98.

11525* Liquid and Gas Dielectrics for Magnetic Component Miniaturization. L. F. Kilham, Jr. and R. R. Ursch. *Electrical Manufacturing*, v. 59, May 1957, p. 140-145.

Significant reduction in size and weight is attained in transformer design by the use of fluorochemical liquids and gases in combination with various heat-conduction techniques. The fluorochemicals combine excellent characteristics as coolants with desirable dielectric and physical properties.

11526* Fluorinated Liquid Dielectric for Fixed Paper Capacitors. Thomas D. Callinan and James B. Romans. *Electrical Manufacturing*, v. 59, May 1957, p. 146 + 4 pages.

Materials usable from −65 to 200 C were developed from partially fluorinated compounds. Properties of these materials and characteristics of impregnated capacitors are discussed.

11527* High-Temperature Magnetic Amplifiers and Transformers. James R. Walker and Max Frank. *Electrical Manufacturing*, v. 59, June 1957, p. 168-173.

Highlights of an Air Force material-component development program evaluating magnetic core materials, conductors, insulation, rectifiers, core mounting methods, and encapsulation techniques.

11528 Electrical Measurements and Their Applications. Walter C. Michels. 331 p. 1957. D. Van Nostrand Co., Princeton. (QC535 M58e)

Instruments and methods used in measurements ranging from d.c. through microwave frequencies. Application of electrical techniques to magnetic, thermal, mechanical, acoustical, and nuclear measurements.

11529 Three-Dimensional Printed Wiring. E. A. Guditz. *Electronics*, v. 30, June 1, 1957, p. 160-163.

Use of four collimated light sources permits exposure of wiring pattern simultaneously on both sides of plastic sheet and through ferrite cores embedded in Cu-plated board after which etching gives completely wired magnetic-core memory plane with no need to thread wires through core holes.

11530* (Russian.) Rates of Voltage Recovery on the Contacts of Circuit Breakers in Large Power Systems. **Skorosti vosstanovleniia napriazheniia na kontaktakh vykliuchatelia v moshchnykh energosistemakh.** M. M. Belousov. *Elektrichestvo*, no. 4, Apr. 1957, p. 21-25.

The constructions of large high-voltage circuit breakers should be calculated for high velocities of voltage recovery. Presents data which can be used as standards for these velocities when testing circuit breakers.

11531* (Russian.) A Statistical Estimate for the Stability of Induction Motor Characteristics. **Statisticheskaia otsenka stabil'nosti kharakteristik asinkhronnykh dvigatelei.** I. P. Isaev. *Elektrichestvo*, no. 4, Apr. 1957, p. 64-69.

Evaluation of the effect of tolerances for various parameters of motors. The statistical method for estimating the stability of characteristics may be applied to any type of motor.

11532* (English.) **Gripping Force of ACSR Compression Type Straight Joint Used for Transmission Lines.** Saburo Yamamoto and Shigeho Fukuda. *Hitachi Review*, v. 6, Feb. 1957, p. 8 + 5 pages.

Strength considerations of joints for steel-reinforced Al conductors.

11533* Commutation of 50 Cycle Single-Phase Commutator Motor for A.C. Locomotive. Toshinobu Ichiki, Sadaharu Kawai, Hiroshi Kimura, and Shoji Mogi. *Hitachi Review*, v. 6, Feb. 1957, p. 13-21.

The condition of the commutation can be judged easily from the state of the H.F. peaks which appear superimposed on the field voltage as observed by a Braun Tube oscilloscope.

11534* Brushless Variable-Speed Induction Motors. F. C. Williams, E. R. Laithwaite, and L. S. Piggott. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. A, Apr. 1957, p. 102-122.

11535* Insulation Properties of Compressed Electronegative Gases. P. R. Howard. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. A, Apr. 1957, p. 123-138.

Sulfur hexafluoride and difluorodichloromethane seem to be worth considering for high-voltage insulation.

11536* Processes Contributing to the Breakdown of Electronegative Gases in Uniform and Non-Uniform Electric Fields. P. R. Howard. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. A, Apr. 1957, p. 139-142.

11537* Electronic-Analogue-Computer Study of Synchronous-Machine Transient Stability. A. S. Aldred and P. A. Doyle. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. A, Apr. 1957, p. 152-160.

11538 Introduction to Electrical Engineering. George V. Mueller. 3rd Ed. 466 p. 1957. McGraw-Hill, New York. (TK 145 M88i3)

Principles of electric and magnetic circuits and fields; application to the solution of typical problems.

11539* Single Phase Double Squirrel Cage Capacitor Motor. T. V. Sreenivasan. *Journal of Scientific & Industrial Research*, v. 16, sec. A, Feb. 1957, p. 73-78.

Except at the extreme limits of very high and very low torque, the double cage capacitor motor appears to have a wide range in which it gives better performance than other motors.

11540 Metallic Rectifiers—Principles and Applications. Leonard R. Crow. 280 p. 1957. Howard W. Sams & Co., Indianapolis. (TK2798 C88m)

Copper-oxide, Se, and Mg-Cu sulfide rectifiers are compared.

11541 Printed Circuitry. II. Development. Allan Lytel. *Military Automation*, v. 1, Mar.-Apr. 1957, p. 82-85.

Historical development; significant commercial techniques. (To be continued.)

11542 Dielectric Thin Films. O. S. Heavens and S. D. Smith. *Optical Society of America, Journal*, v. 47, June 1957, p. 469-472.

Factors which influence the properties of dielectric films formed by thermal evaporation.

11543* Short-Circuit Capability Tests of Load Tap Changer Mechanisms. O. P. McCarty and W. M. Johnson. *Power Apparatus and Systems*, no. 29, Apr. 1957, p. 27-33.

11544* Detection of Faults in Power Transformers. E. A. Klingshirn, H. R. Moore, and E. C. Wentz. *Power Apparatus and Systems*, no. 29, Apr. 1957, p. 87-98.

An evaluation of available devices and schemes for fault detection.

11545* A Semiautomatic Test for Measuring the Loss in Transformer Core Laminations. S. C. Leonard and R. L. Tenbroeck. *Power Apparatus and Systems*, no. 29, Apr. 1957, p. 118-125.

Includes a mathematical analysis of the measuring circuitry.

11546 Where and When to Apply Tilt-Type Mercury Switches. Warner E. Johnson. *Product Engineering*, v. 28, May 1957, p. 159-163.

Mechanical and electrical characteristics, mounting methods, and service effects.

11547* A Method of Calculation of Electrical Conductivity. Huzio Nakano. *Progress of Theoretical Physics*, v. 17, Feb. 1957, p. 145-161.

Method is based upon the theory of relaxation function or after-effect function, from which the general formula for the electrical conductivity is obtained.

11548 Cell for the Determination of Pressure Coefficients of Dielectric Constant and Loss of Liquids and Solids to 10,000 psi. D. W. McCall. *Review of Scientific Instruments*, v. 28, May 1957, p. 345-351.

Data are reported for the liquids benzene, dioxane, and toluene, and for solid polyethylene-5% butyl rubber to illustrate use of the cell.

11549* Electromagnetic Induction in Rotating Conductors. A. Herzenberg and F. J. Lowes. *Royal Society of London, Philosophical Transactions*, v. 249, ser. A, May 1957, p. 507-584.

Results of an investigation of induction in a rotating conductor surrounded by a rigid conductor of finite or infinite extent are applied to a discussion of induction in rotating eddies in the fluid core of the earth as a possible origin of the geomagnetic non-dipole field.

11550* (German.) A Systematic Study of Materials for High Voltage Electrical Contacts. **Systematik der Kontaktstoffe und Starkstromkontakte.** Horst Schreiner. *Zeitschrift für Metallkunde*, v. 48, Apr. 1957, p. 180-190.

See also: **11062** (properties of Ni ferrite); **11170** (nondestructive testing of generator brushes); **11503** (automatic telephone accounting); **11508** (motor controller); **11611** (transistor oscillator for alternator); **11748** (regulation of electric furnaces); **11769** ($MoSi_2$-SiO_2); **11823** (Al-clad Cu wire); **12000** (flexibility of Al cable sheaths); **12250** (calculation of electric energy transmission); **12287** (determination of arc temperature); **12300** (electrical properties of PVC); **12311** (electrical properties of polymers); **12389** (electric system of textile factories).

ELECTROCHEMISTRY

11551 Adsorption Kinetics and Electrode Processes. Paul Delahay and Isaac Trachtenberg. *American Chemical Society, Journal*, v. 79, May 20, 1957, p. 2355-2362.

The above is studied for substances which are not reduced or oxidized at the electrode.

11552 The Mechanisms of Processes at Electrodes. B. E. Conway. *Chemistry in Canada*, v. 9, May 1957, p. 45-48.

Adsorption at electrodes; mechanism of reduction processes; metal deposition reactions.

11553* (Russian.) The Creation of Magnetic Texture by a Magnetic Field in Thin Layers of Iron, Obtained by the Electrolytic Method. **Sozdanie magnitnoi tekstury magnitnym polem v tonkikh sloiakh zheleza, poluchaemykh elektroliticheskim metodom.** N. V. Kotel'nikov. *Doklady Akademii Nauk SSSR*, v. 113, Mar.-Apr. 1957, p. 97-99.

Describes the single-axis texture of the magnetized iron obtained by the above method; effect of condition of the base surface; anisotropic energy; internal stresses; optimum conditions for depositing ferromagnetic layers.

11554 Anodic Oxidation of Aluminum, Chromium, Hafnium, Niobium, Tantalum, Titanium, Vanadium, and Zirconium at Very Low Current Densities. Herman A. Johansen, George B. Adams, Jr., and Pierre Van Rysselberghe. *Electrochemical Society, Journal*, v. 104, June 1957, p. 339-346.

11555 A New Commercial Process for Electrowinning Manganese. M. C. Carosella and R. M. Fowler. *Electrochemical Society, Journal*, v. 104, June 1957, p. 352-356.

Details of pilot and commercial plants. New process makes it possible to smelt Mn ore to ferromanganese and a slag, then recover the Mn in the slag as electrolytic Mn.

11556 Preparation of Thorium Bismuth Dispersions From Electrolytic Thorium. M. E. Sibert, M. A. Steinberg, and R. J. Teitel. *Electrochemical Society, Journal*, v. 104, June 1957, p. 374-378.

Dispersions were prepared successfully in desired concentration, particle size, and shape by addition of crushed Th cathode deposits to Bi, addition of asdeposited cathode to Bi in the cell, and by electrolysis of $ThCl_4$ using a liquid Bi cathode.

11557 Orientation Field Effect of Polyelectrolytes in Solution. Manfred Eigen and Gerhard Schwarz. *Journal of Colloid Science*, v. 12, Apr. 1957, p. 181-194.

Effect of electric field on conductance of KPO_3 solutions.

11558* Electro-Deposition From Sulphamate Solutions. I. Nickel. II. Zinc. S. Sathyanarayana and T. L. Rama Char. *Journal of Scientific & Industrial Research*, v. 16, sec. A, Feb. 1957, p. 78-90.

Optimum plating conditions were established.

11559 Production and Properties of Opaque Coatings by Chromic Acid Anodising. A. W. Brace and R. Peek. *Light Metals*, v. 20, May 1957, p. 166-167.

Attractive properties can be obtained by anodizing Al in 10% CrO_3 at 130 F and 30 volts.

11560 Measurements on Galvanic Cells Involving Solid Electrolytes. Kalevi Kiukkola and Carl Wagner. *Massachusetts Institute of Technology, Department of Metallurgy (U. S. Atomic Energy Commission)*, NYO-7009, Aug. 1956, 36 p. (UF767 U3ny Contin.)

Electromotive force measurements were made in order to obtain the standard molar free energy of formation of CoO, NiO, Cu_2O, Ag_2Se, PbS, and several phases of the system Ag-Te at elevated temperatures.

11561 Surface Treatment and Finishing of Light Metals. XIII. Plated Aluminum—Tests, Corrosion, Applications. S. Wernick and R. Pinner. *Metal Finishing*, v. 55, June 1957, p. 79-84.

Tests; applications; specifications; properties; corrosion resistance.

11562 Metallic Coatings. Charles L. Faust and William H. Safranek. Paper from "Proceedings of Symposium on Preservation for Mobilization Requirements". U. S. Naval Civil Engineering Research and Evaluation Laboratory. 1956. p. 278-314. (TA462 Un3.5p)

A number of metallic coatings are evaluated with reference to their use in long-term storage of military equipment for immediate mobilization. Data on properties, method of application, specifications, coating thickness, and estimated life are included.

11563* (English.) **Method of Refining Silicon by Alloying.** Ichiji Obinata and Noboru Komatsu. *Science Reports of the Research Institutes, Tôhoku University*, ser. A, v. 9, Apr. 1957, p. 118-130.

A new method consisting essentially of electrolysis of an Al-Si anode obtained by alloying crude Si into molten Al.

11564* (Russian.) Copper Plating in Hydroborofluoride Electrolytes. **Mednenie v boroftoristovodorodnykh elektrolitakh.** V. I. Leiner and Iu. A. Velichko. *Vestnik Mashinostroeniia*, v. 37, Apr. 1957, p. 60-64.

Bath composition and operating data.

11565* (Russian.) Electrolytic Production of 4-Component Alloys of Nickel-Iron-Molybdenum-Manganese and Nickel-Iron-Molybdenum-Copper. **Elektroliticheskoe poluchenie chetyrekhkomponentnykh splavov nikel'-zhelezo-molibdenmarganets i nikel'-zhelezo-molibden-med'.** T. F. Frantsevich-Zabludovskaia and K. B. Kladnitskaia. *Zhurnal Prikladnoi Khimii*, v. 30, Mar. 1957, p. 400-406.

See also: **11188** (analysis of Sn-plating solutions); **11342** (solubility of Ag_2SO_4 in electrolytes); **11475** (Cr plating on Al); **11476** (coatings for high-temperature service); **12090** (thickness gage).

ELECTRONICS

11566 Longitudinal Vibration Measurements in the Megacycle Range Made by Electrostatic Drive and Frequency-Modulation Detection. P. G. Bordoni and M. Nuovo. *Acustica*, v. 7, no. 1, 1957, p. 1-7.

Details of the frequency-modulation and detection circuits used, together with typical data upon their sensitivity and signal-to-noise ratio.

11567 Radio Tracking, Orbit and Communication for the Earth Satellite. John P. Hagen. *Aeronautical Engineering Review*, v. 16, May 1957, p. 62-66.

A chain of receiving stations create a radio fence which will intercept a satellite each time it circles the earth.

11568 Component Developments Influencing Aviation Electronics. Luther Davis, Jr. and Lawrence G. Rubin. *Aeronautical Engineering Review*, v. 16, May 1957, p. 79 + 6 pages.

Future electronic components will feature reliability, small size and weight, low power consumption, and operation at elevated temperatures.

11569 Demonstration of Electron and Hole Injection in Alkali Halides. Herbert N. Hersh and Leonard Bronstein. *American Journal of Physics*, v. 25, May 1957, p. 306-310.

Simple experimental setup vividly depicts current flow in insulators by holes or electrons. This is achieved by the trapping of carriers during electron or hole injection in alkali halides giving rise to striking color changes due to the formation of color centers.

11570* Qualitative Analysis of Loop Antenna Behavior in Linearly and Elliptically Polarized Electric Fields. Charles W. Harrison, Jr. *American Society of Naval Engineers, Journal*, v. 69, May 1957, p. 369-374.

In general a loop will not measure the magnetic field faithfully because the sensing element responds to the antenna modes as well as the transmission line mode excited in the loop structure by the incident electromagnetic field. A special shielded loop with two gaps was invented to eliminate or reduce the effect of the antenna modes.

11571 A Reflection Theory for Propagation Beyond the Horizon. H. T. Friis, A. B. Crawford, and D. C. Hogg. *Bell System Technical Journal*, v. 36, May 1957, p. 627-644.

Propagation of short radio waves beyond the horizon is discussed in terms of reflection from layers in the atmosphere formed by relatively sharp gradients of refractive index. Dependence of the propagation on path length, antenna size, and wavelength is obtained.

11572 The Effect of Radiation Damage on the Electronic Properties of Solids. E. W. J. Mitchell. *British Journal of Applied Physics*, v. 8, May 1957, p. 179-189.

Effects of irradiation on the electron mobility in metals, the carrier concentration in Ge, and the optical absorption in quartz and diamond.

11573 Secondary Electron Emission From Barium Dispenser Cathodes. I. Brodie and R. O. Jenkins. *British Journal of Applied Physics*, v. 8, May 1957, p. 202-204.

11574 Epoxide Resins. Electrical Applications of Epoxide Resins Particularly in the Electronics Industry. H. G. Manfield. *Chemistry & Industry*, no. 18, May 4, 1957, p. 530-536.

Properties of these resins as applied to potting of electronic components.

11575* (German.) Photoelectric Semiconductors. **Photohalbleiter.** W. Baumgartner. *Chimia (Switzerland)*, v. 11, Apr. 1957, p. 88-91.

Relationship between absorption and spectral sensitivity in Li-Sb, Cs-O, and Co-S photoelectric layers. Effect of I.R. light on the photoelectric current.

11576* (Russian.) Energy of Ionization by Electrons in Germanium Crystals. **Energiia ionizatsii elektronami v kristallakh germaniia.** V. S. Vavilov, I. S. Smirnov, and V. M. Patskevich. *Doklady Akademii Nauk SSSR*, v. 112, Feb. 21, 1957, p. 1020-1022.

The loss of energy by fast particles passing through crystals is related to ionization. The average energy loss for the formation of one pair of carriers depends on the type of excitation.

11577* Considerations in Testing Thermistors. M. L. Miller. *Electrical Manufacturing*, v. 59, May 1957, p. 102 + 5 pages.

Proper measurement techniques described for thermistor acceptance and design testing include resistance, voltage, time delay, and temperature-resistance slope.

11578* Thermal Considerations in Power Transistor Applications. Bernard Reich. *Electrical Manufacturing*, v. 59, May 1957, p. 162 + 3 pages.

Method of determining operating junction temperature of power transistors for steady state and transient conditions based on one thermal measurement and manufacturer's data.

11579 A Crystal Controlled Signal Generator With an Output of 5W at 937.5 Mc/s. M. T. Stockford. *Electronic Engineering*, v. 29, May 1957, p. 202-205.

11580 Dynamic Methods of Testing Semi-Conductor Rectifier Elements and Power Diodes. II. A. H. B. Walker and R. G. Martin. *Electronic Engineering*, v. 29, May 1957, p. 220-224.

Various approximate methods are compared.

11581 Tolerance Limit of Resistors in Binary Scaling Units. B. M. Banerjee and Sneha Choudhury. *Electronic Engineering*, v. 29, May 1957, p. 237-241.

11582* The Myriatron. Image Dissector for High-Speed Cinematography. G. H. Lunn and R. A. Chippendale. *Electronic & Radio Engineer*, v. 34, May 1957, p. 156-160.

With this tube useful information can be recorded at the rate of 50 pictures in 10^{-6} sec.

11583* Transistor Bias Stabilization. Feedback Circuit for Low-Voltage Operation. J. Somerset Murray. *Electronic & Radio Engineer*, v. 34, May 1957, p. 161-165.

Method of using two transistors in cascade enables the operating conditions of the first to be stabilized to a high degree. Thus, it becomes practicable to operate with a very low collector-base voltage and hence minimize semiconductor noise.

11584 High-Reliability Transistorized Counter. H. C. Chisholm. *Electronics*, v. 30, June 1, 1957, p. 171-173.

Cascaded Si-junction transistor binary stages energize neon-lamp indicators for digital frequency meter at counting rates up to 100,000 per sec.

11585* (Russian.) Large Semiconductor Rectifiers and Their Applications in Industry. **Moshchnye poluprovodnikovye vypriamiteli i ikh primenenie v promyshlennosti.** I. B. Iuditskii. *Elektrichestvo*, no. 4, Apr. 1957, p. 1-7.

The use of Ge and Si rectifiers in automatic equipment and computers.

11586* (Russian.) The Multi-Electron Theory of Semiconductors. **K mnogoelektronnoi teorii poluprovolnikov. II.** Ferromagnetic Semiconductors. **Ferromagnitnye poluprovodniki.** Iu. P. Irkhin and E. A. Turov. *Fizika Metallov i Metallovedenie*, v. 4, no. 1, 1957, p. 9-13.

11587 Frequency Modulation Receivers. J. D. Jones. 114 p. 1957. Philosophical Library, New York. (TK6553 J71f)

Radio broadcasting principles; details of the R. F. stage, frequency changes, I. F. stage, and FM detector; methods of measuring performance; operating data.

11588 The Effect of Fading on Communication Circuits Subject to Interference. F. E. Bond and H. F. Meyer. *I.R.E., Proceedings*, v. 45, May 1957, p. 636-642.

The statistical performance of radio communication circuits in the presence of interference is analyzed for the cases where either the desired or undesired signal or both are subject to Rayleigh fading over the propagation path. The significant parameter considered is the ratio of mean signal power to mean interference power needed at the receiver for satisfactory performance.

11589 Microwave Frequency Doubling From 9 to 18 KMC in Ferrites. J. L. Melchor, W. P. Ayres, and P. H. Vartanian. *I.R.E., Proceedings*, v. 45, May 1957, p. 643-646.

At high peak powers, frequency doubling in ferrites can be made more efficient than low-power doubling in crystals. The ferrite will stand higher average power and it is not irreparably damaged if overlooked.

11590 Temperature Dependence of Junction Transistor Parameters. Wolfgang W. Gärtner. *I.R.E., Proceedings*, v. 45, May 1957, p. 662-680.

Based on existing design theories and the known temperature behavior of the semiconductor properties, the temperature variations of transistor characteristics are calculated for four representative types.

11591 Design of Three-Resonator Dissipative Band-Pass Filters Having Minimum Insertion Loss. J. J. Taub and B. F. Bogner. *I.R.E., Proceedings*, v. 45, May 1957, p. 681-687.

11592 Designing for Reliability. Norman H. Taylor. *I.R.E., Proceedings*, v. 45, June 1957, p. 811-822.

A detailed example of a high-speed, vacuum-tube flip-flop is used for illustration of the steps required to achieve reasonable component tolerances and adequate safety margins.

11593 Topological Analysis of Linear Nonreciprocal Networks. Samuel J. Mason. *I.R.E., Proceedings*, v. 45, June 1957, p. 829-838.

Use of the unistor, a branch-like element whose current is proportional to one of its two terminal potentials and independent of the other terminal potential, or the gyristor, whose current is proportional to the sum of its two terminal potentials, to model a linear network.

11594 Theory and Experiments on Shot Noise in Semiconductor Junction Diodes and Transistors. W. Guggenbuehl and M. J. O. Strutt. *I.R.E., Proceedings*, v. 45, June 1957, p. 839-854.

Presents a general theory of junction diode and transistor shot noise in the region of low-level injection currents as dependent on frequency including L.F. and H.F. regions. Equations for noise figures in the three basic transistor connections are derived.

11595 The High Current Limit for Semiconductor Junction Devices. Neville H. Fletcher. *I.R.E., Proceedings*, v. 45, June 1957, p. 862-872.

At very high operating levels the density of carriers injected into the body of a semiconductor junction device is comparable with the carrier density in the emitter regions of the device. The effect of these high densities on the lifetime and mobility of carriers is considered, and new equations are derived relating the carrier densities on either side of a forward biased junction.

11596 Adjustable Pulse Width High-Voltage Pulsed Power Supply. Victor Wouk. *Institute of Radio Engineers, Transactions on Instrumentation*, v. I-6, Mar. 1957, p. 3-6. (TK1 In6.6i Contin.)

Pulser employs series and shunt switching tubes. A specific application to a 10-kv. pulser is described, with pulse repetition rates from 10 c.p.s. to 10 kc., rise and decay times of 2μ sec. and adjustable duty cycles from 0.001 to 0.99.

11597 Complete Linear Characterization of Transistors From Low Through Very High Frequencies. Henry G. Follingstad. *Institute of Radio Engineers, Transactions on Instrumentation*, v. I-6, Mar. 1957, p. 49-63. (TK1 In6.6i Contin.)

Theory of insertion measurement permits accurate and complete linear characterization of transistors from low through V.H.F.

11598 Report of Advances in Microwave Theory and Techniques, 1956. Donald D. King. *Institute of Radio Engineers, Transactions on Microwave Theory and Techniques*, v. MTT-5, Apr. 1957, p. 83-91. (TK1 In6.6mt Vis.)

Covers ferrites, waveguides, measurements, and sources and detectors.

11599 The Impedance of a Wire Grid Parallel to a Dielectric Interface. James R. Wait. *Institute of Radio Engineers, Transactions on Microwave Theory and Techniques*, v. MTT-5, Apr. 1957, p. 99-102. (TK1 In6.6mt Vis.)

An analysis of the problem of reflection of a plane wave at oblique incidence on a wire grid which is parallel to a plane interface between two homogeneous dielectrics.

11600 Synthesis of a Class of Microwave Filters. Harold Seidel. *Institute of Radio Engineers, Transactions on Microwave Theory and Techniques*, v. MTT-5, Apr. 1957, p. 107-114. (TK1 In6.6mt Vis.)

New model permits development of a synthesis procedure for the wideband filter. Designs employing this model, and the appropriate synthesis, show significant improvement of desired characteristics over conventional designs.

11601 Single Slab Arbitrary Polarization Surface Wave Structure. Robert C. Hansen. *Institute of Radio Engineers, Transactions on Microwave Theory and Techniques*, v. MTT-5, Apr. 1957, p. 115-120.

Structure consists of a single dielectric layer on a ground plane with parallel metal plates or septa imbedded in the dielectric, normal to and in contact with the ground plane. Propagation is along the plates.

11602 The Statistical Prediction of Voltage Standing-Wave Ratio. J. A. Mullen and W. L. Pritchard. *Institute of Radio Engineers, Transactions on Microwave Theory and Techniques*, v. MTT-5, Apr. 1957, p. 127-130. (TK1 In6.6mt Vis.)

11603 Circularly Polarized Microwave Cavity Filters. Conrad E. Nelson. *Institute of Radio Engineers, Transactions on Microwave Theory and Techniques*, v. MTT-5, Apr. 1957, 136-147. (TK1 In6.6mt Vis.)

Theoretical analysis proves that a single, circularly polarized cavity may be used to construct a reflectionless band-pass and band-elimination filter that is capable of coupling nearly 100% of the energy from the main waveguide at resonance.

11604 The Relationship of Physical Applications of Fourier Transforms in Various Fields of Wave Theory and Circuitry. E. Folke Bolinder. *Institute of Radio Engineers, Transactions on Microwave Theory and Techniques*, v. MTT-5, Apr. 1957, p. 153-158. (TK1 In6.6mt Vis.)

11605 The Selection of Coatings for Printed Wiring. R. A. Martel and L. J. Martin. *Institute of Radio Engineers, Transactions on Production Techniques*, PGPT-2, Apr. 1957, p. 125-130. (TK1 In6.6p Contin.)

A total of 48 coating materials, consisting of solvent proprietary blends and laboratory formulations, are evaluated.

11606 The Design and Life of Planar Microwave Transmitting Tubes. H. D. Doolittle. *Institute of Radio Engineers, Transactions on Vehicular Communications*, PGVC-8, May 1957, p. 31-35. (TK1 In6.6v Contin.)

Progress report on life improvement from a few hundred to a few thousand hrs. for mobile equipment and to many thousands of hrs. for less critical applications.

11607 Noise in Communications Antennas—Survey. M. W. Scheldorf. *Institute of Radio Engineers, Transactions on Vehicular Communications*, PGVC-8, May 1957, p. 60-65. (TK1 In6.6v Contin.)

Sources of noise; effective solutions.

11608* Effect of Magnetocrystalline Anisotropy on the Magnetic Spectra of Mg-Fe Ferrites. G. T. Rado, V. J. Folen, and W. H. Emerson. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, Suppl. no. 5, 1957, p. 198-205.

The R.F. dispersion region and the static initial permeability are primarily due to domain wall displacements. The microwave dispersion region is primarily due to domain rotations that occur in an effective field caused by magnetocrystalline anisotropy as well as by static and dynamic magnetic interactions.

11609* Frequency-Modulated V.H.F. Transmitter Technique. A. C. Beck, F. T. Norbury, and J. L. Storr-Best. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, May 1957, p. 225-238.

11610* Propagation Characteristics of Low-Loss Tubular Waveguides. H. E. M. Barlow and H. G. Effemey. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, May 1957, p. 254-260.

Practicability of low-loss H_{01} waveguides in straight lengths was demonstrated. Application to this purpose of standard solid-drawn Cu or Al tubes, manufactured to commercial tolerances and erected without special attention to alignment.

11611* Design Considerations of Junction-Transistor Oscillators for the Conversion of Power From Direct to Alternating Current. F. Oakes. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, May 1957, p. 307-317.

11612* (Russian.) Some Problems of Semiconductor Catalysis. **O nekotorykh voprosakh poluprovodnikovogo kataliza.** F. F. Vol'kenshtein. *Izvestiia Akademii Nauk SSSR, Seriia Fizicheskaia*, v. 21, Feb. 1957, p. 179-182.

The electrons and holes of the crystal lattice are direct participants in, and even regulators of, chemical processes developing on the surface of semiconductors.

11613 Electron Beam Analyzer. A. Ashkin. *Journal of Applied Physics*, v. 28, May 1957, p. 564-569.

Technique for measuring the charge distribution of an electron beam in a magnetic field is especially applicable to the long, thin, high-current beams commonly used in traveling wave tubes and backward wave oscillators. It consists of making the beam trace out its own characteristics by sweeping it across a pinhole in crossed electric and magnetic fields.

11614* A Study of the Broadband Frequency Response of the Multicavity Klystron Amplifier. K. H. Kreuchen, B. A. Auld, and N. E. Dixon. *Journal of Electronics*, v. 2, ser. 1, May 1957, p. 529-567.

11615* Some Aspects of Peltier Heating at Liquid-Solid Interfaces in Germanium. W. G. Pfann, K. E. Benson, and J. H. Wernick. *Journal of Electronics*, v. 2, ser. 1, May 1957, p. 597-608.

Peltier heating at a liquid-solid interface has unique advantages in controlling crystal growth processes in semiconductors and certain metals. The heat effect is produced at the interface without time-lag and can be reversed by reversing the current. Uses in growing single crystals, in producing n-p-n and n-p-n-p junctions in semiconductors, and in temperature gradient zone melting are discussed.

11616* Frequency Conversion With Nonlinear Reactance. Chester H. Page. *Journal of Research, National Bureau of Standards*, v. 58, May 1957, p. 227-236.

A lossless nonlinear impedance subject to an almost periodic voltage will absorb power at some frequencies and supply power at other frequencies. Simple cubic capacitors are sufficient for producing any possible conservative modulation or distortion process.

11617* Slotted-Cylinder Antenna With a Dielectric Coating. James R. Wait and Walter Mientka. *Journal of Research, National Bureau of Standards*, v. 58, June 1957, p. 287-296.

Analysis is presented for the fields produced by an arbitrary slot on a circular cylinder which has a concentric dielectric coating. Expressions for the far-zone fields are developed by evaluating the appropriate integrals using a saddle-point method. Numerical results are presented for the case of a narrow axial slot for a range of values of cylinder diameters and electrical constants of the dielectric coating.

11618 A High Speed Electronic Analogue Field Mapper. R. B. Burtt and J. Willis. *Journal of Scientific Instruments*, v. 34, May 1957, p. 177-182.

A complete field is mapped in a twenty-fifth of a second and continuous repetition gives the effect of a moving picture.

11619 The A.C. Properties of Resistors and Potential Dividers at Power and Audio Frequencies, and Their Measurement. G. H. Rayner and L. H. Ford. *Journal of Scientific Instruments*, v. 34, May 1957, p. 190-196.

11620 National Electronics Conference, Proceedings. v. XII. 1095 p. 1956. National Electronics Conference, Chicago. (TK161 N21p Vis.)

Covers papers presented at Chicago meeting, Oct. 1-3, 1956. Includes reports on components, circuits, measurements, applications, and reliability studies.

11621* (German.) The Electrical and Mechanical Impedance of Electroacoustic Transducers. **Die elektrische und die mechanische Impedanz von elektroakustischen Wandlern.** Richard Bierl. *NTZ; Nachrichtentechnische Zeitschrift*, v. 10, Apr. 1957, p. 160-167.

Equivalent electro-mechanical circuits, which take impedance variations during oscillations into account, can be given for all electro-acoustic transducers and the radiators coupled with them when the electro-mechanical coupling factor is fully known.

11622* (German.) Directional Antennas With Apertures of Special Shapes. **Richtantennen mit besonderen Aperturformen.** G. F. Koch. *NTZ; Nachrichtentechnische Zeitschrift*, v. 10, Apr. 1957, p. 175-186.

The side lobe levels in the radiation pattern for one plane of aperture radiators can be made considerably smaller when apertures with a suitable shape are chosen instead of the rectangular, round, or elliptical shapes used so far.

11623* (English.) **On the Atomic Displacements Produced by α-Particles in Germanium.** A. Ascoli, M. Asdente, and E. Germagnoli. *Nuovo Cimento*, v. 5, ser. 10, May 1957, p. 1145-1152.

The number of negative carriers which are removed from the conduction band by irradiation of Ge single crystals with PO^{210} α-particles is measured from the initial rate of decrease of conductivity in *n*-type Ge.

11624* (English.) **Test Set for 3-cm Radar Equipment.** J. Verstraten. *Philips Telecommunication Review*, v. 17, Apr. 1957, p. 123-130.

Set permits measurement of the forward and reflected aerial power and of the frequency generated by the radar magnetron. It may further be used for the frequency line-up of the receiver local oscillator and for turning the transmit-receive switch. Set is arranged for direct connection to single-phase mains.

11625 Internal Field Emission in Silicon *p-n* Junctions. A. G. Chynoweth and K. G. McKay. *Physical Review*, v. 106, ser. 2, May 1, 1957, p. 418-426.

Evidence that high fields in the space charge region result in considerable internal field emission from zero bias on up to the highest reverse biases attainable.

11626 Field Effect in Germanium at High Frequencies. H. C. Montgomery. *Physical Review*, v. 106, ser. 2, May 1, 1957, p. 441-445.

Changes in conductivity near the surface of Ge in response to an a.c. electric field were investigated at frequencies as high as 50 Mc. per sec. for both *n*- and *p*-type materials, and in wet air, dry oxygen, and ozone ambients.

11627 Surface States on Silicon and Germanium Surfaces. H. Statz, G. DeMars, L. Davis, Jr., and A. Adams, Jr. *Physical Review*, v. 106, ser. 2, May 1, 1957, p. 455-464.

11628* An Approach to Microwave Relaying and System Design. J. R. Linders and V. A. Nosko. *Power Apparatus and Systems*, no. 29, Apr. 1957, p. 19-27.

Background of system development and system needs. Selection of relaying components and methods. Additional functions controlling microwave signals. Applications.

11629* The Scattering Effect of a Junction Between Two Circular Waveguides. V. M. Papadopoulos. *Quarterly Journal of Mechanics and Applied Mathematics*, v. 10, May 1957, p. 191-209.

The exact solution is found for the electromagnetic problem of the scattering effect of a junction between two semi-infinite circular pipes of radiux a and b respectively ($a > b$) and having the same axis. The solution involves constants which satisfy an infinite set of equations.

11630 Radio Aids to Air Navigation. J. H. H. Grover. 138 p. 1957. Philosophical Library, New York. (TL695 G91r)

Performance, capabilities, and methods of operation of the different types of navigational radio equipment.

11631 Radio and Electronic Components. v. II. Variable Resistors and Potentiometers. G. W. A. Dummer. 176 p. 1956. Sir Isaac Pitman & Sons, Ltd., London. (TK6565.R426 D89v)

Types; measurements; characteristics; future design possibilities.

11632 Rectifying Semi-Conductor Contacts. H. K. Henisch. 372 p. 1957. Oxford University Press, London. (TK2798 H39r)

Electronic equilibrium in solids, bulk properties of important semiconductors; structure and voltage current characteristics of plate and point-contact rectifiers; rectifiers as capacitive circuit elements; theories of unipolar rectification, injecting contacts, and special contacts.

11633 The Packaging of Electronic Equipment. Equipment, Design and Methods of Shock Protection. S. C. Schuler. *Royal Aeronautical Society, Journal*, v. 61, May 1957, p. 335-344.

Transit and handling shock and vibration conditions; equipment fragility; properties of cushioning materials; instrumentation in packaging investigations; packaging techniques.

11634 Servicing and Calibrating Test Equipment. Milton S. Kiver. 184 p. 1956. Howard W. Sams & Co., Indianapolis. (TK7870 K65s)

Pitfalls to avoid in using electronic test equipment; checking equipment accuracy; keeping operational records; preventive maintenance; servicing test equipment.

11635 Tube Design Considerations for Low-Voltage Operation in Hybrid Circuitry. Robert J. Bisso. *Sylvania Technologist*, v. 10, Apr. 1957, p. 38-41.

Observations made during the development of the high-perveance pentode, type 12CX6, are discussed.

11636 The Unreliable Universal Component. Marcus A. Acheson. *Sylvania Technologist*, v. 10, Apr. 1957, p. 42-46.

Concludes that there is no such thing as a reliable universal tube so long as specifications require that a tube pass tests having no bearing on its intended application.

11637* Transistor Engineering Reference Handbook. H. E. Marrows. Sections individually paged. 1956. John F. Rider, New York. (TK7872.T73 M34t Ref.)

Includes technical specification sheets on some 200 types of commercial transistors, also data on transistor components and commercial applications.

11638 V.H.F. Television Tuners. D. H. Fisher. 136 p. 1957. Philosophical Library, New York. (TK6655.U6 F53v)

Tuner design and construction. Tests, measurements, and servicing.

11639* (Russian.) Germanium Point-Contact Triodes Having a Short Life of the Secondary Current Carriers. **Tochechnye triody iz germaniia s malym vremenem zhizni neosnovnykh nositelei toka.** A. N. Kvasnitskaia, E. B. Mertens, E. G.

Miseliuk, and A. I. Skopenko. *Zhurnal Tekhnicheskoi Fiziki*, v. 27, Mar. 1957, p. 437-440.

An investigation on possibilities of using Ge triodes in fast-acting pulse systems.

11640* (Russian.) Influence of Surface Recombination on the Efficiency of a Photoelectric Cell With a P-N Transition. **Vliianie poverkhnostnoi rekombinatsii na koeffitsient poleznogo deistviia fotoelementa i *p-n*-perekhodom.** G. L. Bir and G. E. Pikus. *Zhurnal Tekhnicheskoi Fiziki*, v. 27, Mar. 1957, p. 467-472.

Determines the voltampere rating, and the efficiency of a photocell with p-n transition under consideration of the surface recombination. Conditions of minimum loss are shown.

11641* (Russian.) Auto-Electronic Emission From Cadmium Sulfide and Selenide. **Avtoelektronnaia emissiia s sulfida i selenida kadmiia.** A. I. Klimin. *Zhurnal Tekhnicheskoi Fiziki*, v. 27, Apr. 1957, p. 719-721.

Spectral distribution of the emission current when subject to light of various wavelengths.

See also: **11077** (glass components); **11080** (ferrites for microwave applications); **11488** (Al_2O_3 deposits in electron tubes); **11512** (thermionic rheostat); **11518** (cryotron); **11755** (electronic particle counter); **11756** (electronic level indicator and controller); **11998** (heat conductivity in semiconductors); **12108** (drift of electrons through gases); **12118** (electron accelerator); **12208** (human engineering in design of equipment); **12216** (human engineering in design of electronic equipment); **12243** (drift of electrons in gases); **12261** (photoconductivity of ZnO); **12274** (photoelectric emission from KI); **12281** (photoelectric properties of HgI_2); **12289** (scattering of electromagnetic waves); **12376** (cooling electronic equipment).

ENGINEERING ECONOMICS

11642* The Chemical Industry Facts Book. 3rd Ed. 149 p. 1957. Manufacturing Chemists' Assn., Washington, D. C. (TP200 C42 Ref.)

Facts about the origins, operations, people, accomplishments, and goals of the industry. Includes economic statistics.

11643 Chemical Process Economics in Practice. J. James Hur, editor. 115 p. 1956. Reinhold Publishing Corp., New York. (HD9650.6 H93c)

Seven papers consider accounting terms, meanings, and practices in industry; plant investment; cost of services; plant operating costs; relationship of price to value; economic analysis; and financing the plant.

11644 Economic Survey of Latin America, 1955, Including an Essay on Government Income and Expenditure, 1947-1954. 176 p. 1956. United Nations, Department of Economic and Social Affairs, New York. (HC161 U3e)

Covers economic development trends, foreign trade, agriculture, industry, mining, energy, and the wood-working industries.

11645* Canada's Engineering and Industrial Achievements in 1956. *Engineering Journal*, v. 40, May 1957, p. 557-656.

Mineral resources; power development; communications and transport; construction; industrial production; pulp and paper; national defense; government works; engineering research.

11646 The Industrial Structure of American Cities. A Geographic Study of Urban Economy in the United States. Gunnar Alexandersson. 133 p. 1956. University of Nebraska Press, Lincoln. (HC106 AL27i)

Examines the national distribution patterns of 36 urban industries represented in the 1950 census, with special attention focused on their city-forming importance.

11647 Investment in Central America. Basic Information for United States Businessmen. 273 p. 1956. Available from Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. (HC141 Un3.3i)

Statistics on economic conditions in Costa-Rica, El Salvador, Guatemala, Honduras, and Nicaragua.

11648* Market Planning Workbook. 2nd Ed. 244 p. 1957. McGraw-Hill, New York. (HC101 M45i2 Ref.)

Geographical statistics which facilitate accurate appraisal of the relative importance of each industrial area in the U. S. Includes manufacturing, construction, mining, utilities, services, and retail and wholesale trades statistics.

11649 Nickel Handbook and Commercial Outlook for 1957. Not paged. 1957. Herman B. Director Associates, Washington, D. C. (HD9539.N52 D62n)

Supply and consumption information; prices; government activities; primary and secondary suppliers.

11650* Graphical Methods of Making Long-Term Market Estimates. D. W. Finley. *Royal Australian Chemical Institute, Proceedings*, v. 24, Mar. 1957, p. 145-162.

The quick graphical methods presented are more reliable than older methods.

11651 World Petroleum Report. Gordon H. Barrows and Eloise Mickel, editors v. III. 282 p. 1957. Mona Palmer Publishing Co., New York. (TN862 W89.6 Over.)

A summary of all the major factors affecting oil operations in 64 areas of the world.

See also: **11498** (effects of automation on economics); **11764** (solar furnace design costs); **11832** (titanium industry); **12103** (atomic energy for underdeveloped countries); **12209** (factors in industrial productivity); **12397** (Australian pulp and paper industry).

FLUID MECHANICS

11652 The Unsteady Laminar Boundary Layer on a Flat Plate. Sin-I Cheng and David Elliott. *ASME, Transactions*, v. 79, May 1957, p. 725-733.

Considers the problem of a semi-infinite flat plate started initially from rest in an incompressible fluid with an arbitrary velocity without flow reversal.

11653 Natural-Convection Heat Transfer From a Horizontal Cylinder Rotating in Air. David Dropkin and Arieh Carmi. *ASME, Transactions*, v. 79, May 1957, p. 741-749.

Up to a certain value of Reynolds number, rotation has no effect on the heat-transfer coefficient. Above this critical value the heat-transfer coefficient increases as the speed of rotation increases.

11654 Experimental Study of the Velocity and Temperature Distribution in a High-Velocity Vortex-Type Flow. J. P. Hartnett and E. R. G. Eckert. *ASME, Transactions*, v. 79, May 1957, p. 751-758.

11655 Effect of Axial Fluid Conduction on Heat Transfer in the Entrance Regions of Parallel Plates and Tubes. P. J. Schneider. *ASME, Transactions*, v. 79, May 1957, p. 765-773.

Zero and finite axial-conduction solutions for the local and mean fluid temperature and the local total Nusselt number are presented for uniform-ambient temperature and step discontinuity in the ambient temperature.

11656 On the Changing Size Spectrum of Particle Clouds Undergoing Evaporation, Combustion, or Acceleration. A. H. Shapiro and A. J. Erickson. *ASME, Transactions*, v. 79, May 1957, p. 775-788.

The general differential equation governing the concentration of particles as a function of size, position, and time is formulated for one-dimensional duct-type flows.

11657* Transient Fluid Motions in Saturated Porous Media. J. R. Philip. *Australian Journal of Physics*, v. 10, Mar. 1957, p. 43-53.

An approximate analysis indicates that the time for the effective establishment of the steady motion is proportional to the permeability and inversely proportional to the kinematic viscosity.

11658* Using an Aerofoil as a Means of Flow Measurement. C. E. R. Sams. *British Chemical Engineering*, v. 2, May 1957, p. 259-262.

11659* Asymptotic Behavior and Uniqueness of Plane Subsonic Flows. R. Finn and D. Gilbarg. *Communications on Pure and Applied Mathematics*, v. 10, Feb. 1957, p. 23-63.

11660 Slow Shearing Motion Over a Hollow. G. Power and D. L. Scott-Hutton. *Franklin Institute, Journal*, v. 263, May 1957, p. 431-439.

The slow, steady two-dimensional motion of a viscous liquid over a hollow in an infinite plane is considered, the flow being that of uniform shear except for the disturbance caused by the hollow.

11661 Rheological Behavior of Thorium Oxide Slurries in Laminar Flow. P. R. Crowley and A. S. Kitzes. *Industrial and Engineering Chemistry*, v. 49, May 1957, p. 888-892.

The slurries are plastic non-Newtonian fluids at ambient temperatures. Viscosity can be expressed in terms of shear stress and concentration.

11662 Hydrodynamic Theory for the Flow of a Viscoelastic Fluid. Yoh-Han Pao. *Journal of Applied Physics*, v. 28, May 1957, p. 591-598.

Theory is applied to two-dimensional steady-state simple shear flow to predict the variation of the apparent viscosity and the steady-state elastic compliance with shear rate.

11663 Hydrodynamics. The Art of Silence. George F. Wislicenus. *Missiles and Rockets*, v. 11, May 1957, p. 108-109.

The role and control of cavitation in torpedo design.

11664* Some Transition Forms Between Rapid and Tranquil Flow. N. V. Feodoroff and B. A. Bakhmeteff. *New York Academy of Sciences, Transactions*, v. 19, Apr. 1957, p. 518-533.

A series of experiments with a narrow rectangular horizontal opening in the vertical wall of a channel.

11665* (English.) **On the Transonic Flow of a Compressible Fluid Past an Axisymmetric Slender Body at Zero Incidence.** Ken-ichi Kusukawa. *Physical Society of Japan, Journal*, v. 12, Apr. 1957, p. 401-410.

11666* (English.) **On the Transonic Flow of a Compressible Fluid Past a Nearly Axisymmetric Slender Body.** Ken-ichi Kusukawa. *Physical Society of Japan, Journal*, v. 12, Apr. 1957, p. 411-419.

Examples are the flow past an elliptic paraboloid of finite length and the head drag and the lift coefficients of a paraboloid of revolution of finite length.

11667* (English.) **Expansion Formulae for the Forces Acting on Two Equal Circular Cylinders Placed in a Uniform Stream at Low Values of Reynolds Number.** Hiroomi Fujikawa. *Physical Society of Japan, Journal*, v. 12, Apr. 1957, p. 423-430.

11668* Wave Propagation in Non-Linear Fields. Tosiya Taniuti. *Progress of Theoretical Physics*, v. 17, Mar. 1957, p. 461-486.

Study of one-dimensional propagation, shock waves, and energy distribution.

11669* The Stability of Jets of Viscoelastic Gels. S. Lifson. *Research Council of Israel, Bulletin*, v. 6A, Jan. 1957, p. 119-124.

The stability of linear jets of viscoelastic gels streaming through air is found to be dependent on their elastic coefficient. The critical velocity for the jet, above which it becomes unstable, is calculated as a function of the elastic coefficient, the density of the surrounding medium, the thickness of the jet, and the wavelength of the disturbance.

11670 Wave Induction on a Vertical Water Film by an Accelerating Airstream. J. F. Davidson and J. E. Howkins. *Royal Society, Proceedings*, v. 240, ser. A, Apr. 24, 1957, p. 29-41 + 1 plate.

11671 Similar Solutions for the Compressible Laminar Boundary Layer With Heat Transfer and Pressure Gradient. Clarence B. Cohen and Eli Reshotko. *U. S. National Advisory Committee for Aeronautics, Report* 1293, 1956, 38 p. (TL521 Un3r Vis.)

11672 Viscous Flow Theory. v. I. Laminar Flow. v. II. Turbulent Flow. 384 and 277 p. 1956 and 1957. D. Van Nostrand Co., New York. (QA929 P15v)

Fundamental equations of fluid dynamics. Laws of friction and heat conduction. Compressibility. Boundary layer theory.

11673* (English.) **On the Adiabatic Couette Flow of a Compressible Fluid.** William F. Hughes and J. Fletcher Osterle. *Zeitschrift für Angewandte Mathematik und Physik*, v. 8, Mar. 1957, p. 89-96.

Investigates the adiabatic flow of air through a narrow passage between two parallel plates.

11674* (English.) **Jet Issuing in All Directions From a Thin Slit Round a Circular Cylinder of Small Radius Containing Liquid Under Pressure.** Lakshmi Sanyal. *Zeitschrift für Angewandte Mathematik und Physik*, v. 8, Mar. 1957, p. 156-159.

Mathematical analysis of flow parameters.

See also: **11117** (fluid mechanics); **11447** (hydrodynamics of oscillating disks); **11504** (hydraulic control valve); **11749** (liquid level measurement); **11757** (flow and level measurement); **12310** (flow of viscous liquids); **12378** (design of ducts).

FOOD TECHNOLOGY

11675* Exposure of Foods and Foodstuffs to Nuclear Explosions. Edwin P. Laug. *Association of Official Agricultural Chemists, Journal*, v. 40, May 1957, p. 544-561.

Typical foods of all types were tested under various exposure situations to determine the effects of heat, atmospheric pressure waves, and the immediate radiation emanating from a nuclear explosion.

11676 Canned Foods, an Introduction to Their Microbiology. J. G. Baumgartner and A. C. Hersom. 4th Ed. 291 p. D. Van Nostrand Co., Princeton. (TX552 B32c4)

Principles and procedures of canning food processing; types of spoilage; containers; effects of heat on microorganisms.

11677* Direct Steam Injection for High Temperature Short Time Sterilization of Whole Kernel Corn. J. L. Vetter, A. I. Nelson, and M. P. Steinberg. *Food Technology*, v. 11, May 1957, p. 271-274.

By this procedure 5,000,000 spores of NCA organism 1518 per No. 2 can of whole kernel sweet corn can be destroyed within 150 sec.

11678 Cost Estimate for the Food Irradiation Reactor. *Internuclear Company (U. S. Atomic Energy Commission)*, AECU-3384, Aug. 1956, 14 p. (UF767 U3au Contin.)

11679 Antioxidant Determination. Determination of 2,6-Di-*tert*-Butyl-*p*-Cresol in Edible Fats by Ultraviolet Spectrophotometry. Marjorie A. Phillips and R. D. Hinkel. *Journal of Agricultural and Food Chemistry*, v. 5, May 1957, p. 379-384.

The lard sample is dissolved in cyclohexane and silicic acid used as absorbent.

11680* Effects of Gamma Radiation on Certain Water-Soluble Vitamins in Raw Ground Beef. E. J. Day, H. D. Alexander, H. E. Sauberlich, and W. D. Salmon. *Journal of Nutrition*, v. 62, May 1957, p. 27-38.

Doses of about 3 megarep resulted in the destruction of about 10% of the riboflavin and 25% of the pyridoxine. Very little, if any, of inositol, niacin, or tryptophan in beef was destroyed.

11681* The Bioassay of Thiamine in Beef Exposed to Gamma Radiation. E. J. Day, H. E. Sauberlich, H. D. Alexander, and W. D. Salmon. *Journal of Nutrition*, v. 62, May 1957, p. 107-118.

Doses of 3 megarep destroyed up to 66% of the thiamine. Effects of various dietary supplements on the growth of rats are reported.

See also: **11753** (consistency recording and control); **12446** (Al in food processing).

FUELS AND COMBUSTION

11682 Factors and Limitations Involved in the Use of Industrial Gases for Underfiring Coke Ovens. L. G. Tucker, Jr. *Blast Furnace and Steel Plant,* v. 45, May 1957, p. 483-488.

Includes rich and lean gas techniques. (To be continued.)

11683* (German.) Observing Pitch in Coal Briquette With the Microscope. **Beobachtung des Pechs in Steinkohlenbriketts unter dem Mikroskop.** Erich Friehmelt. *Brennstoff-Chemie,* v. 38, Apr. 1957, p. 97-102.

In polished sections of briquette, pitch was observed by temper coloring when special immersion oils were used. Composition of the "pitch motar" was determined.

11684 The Use of Radioactive Tracers. R. F. Littlejohn and D. H. T. Spencer. *British Coal Utilization Research Association, Monthly Bulletin,* v. 21, Feb. 1957, p. 53-64.

Tracer methods of direct interest in the field of fuel technology are reviewed.

11685 The Decomposition Burning of Monopropellant Drops: Hydrazine, Nitromethane, and Ethyl Nitrate. Willis A. Rosser, Jr. *California Institute of Technology, Jet Propulsion Laboratory, Progress Report No.* 20-305, Jan. 1957, 12 p. (TL501 C12p Contin.)

The mass evaporation rate of a simulated hydrazine drop is studied in the presence of an enclosing hydrazine-decomposition flame. The drop is simulated by a porous alumina sphere internally supplied with liquid hydrazine. A number of significant parameters are varied in order to determine their effect on the evaporation rate.

11686 On Flame Propagation in Explosive Mixtures of Gases. IV. On the Decomposition Flame of Ozone in Mixtures Rich in Ozone. Robert Sandri. *Canadian Journal of Chemistry,* v. 35, May 1957, p. 474-476.

11687 Developments in Industrial Furnaces. M. W. Thring. *Fuel Efficiency,* v. 5, Apr. 1957, p. 160-164.

Discusses the design of some modern industrial furnaces and shows how this effects efficiency.

11688 Carbonization of Anthracene and Graphitization of Anthracene Carbons. C. R. Kinney, R. C. Nunn, and P. L. Walker, Jr. *Industrial and Engineering Chemistry,* v. 49, May 1957, p. 880-884.

High temperatures, high rates of charring, and/or removal of tars before further carbonization favor formation of graphitizable chars from anthracene.

11689* The Liquefaction of Naturally Occurring Methane. N. R. Barber and G. G. Haselden. *Institution of Chemical Engineers, Transactions,* v. 35, no. 2, 1957, p. 77-86.

Design of liquefaction plant for natural gas and methane from mine-drainage gas. Power consumption of various liquefaction cycles; purification problems; operating costs.

11690 Experience With the B.I.S.R.A. Burner. Kurt Schermer. *Iron & Steel,* v. 30, June 1957, p. 215-218.

Oil burner construction for open-hearth furnaces. Comparative production trial of the B.I.S.R.A. and another type of burner in an all-basic 110-ton single-uptake and a similar capacity twin-uptake furnace. Description of the two types of burners. Results of trials on 200 heats.

11691 An Automatic System of Fuel Control. Donald R. Mathews. *Iron and Steel Engineer,* v. 34, May 1957, p. 82-88.

With automatic fuel control, the use of coke oven gas for fuel in the open-hearth has resulted in making steel with lower fuel and rebuilding costs.

11692 Studies of Diffusion Flames. III. The Diffusion Flames of the Butanols. S. Ruven Smith, Alvin S. Gordon, and Maynard H. Hunt. *Journal of Physical Chemistry,* v. 61, May 1957, p. 553-558.

Analysis of the precombustion products indicate that the mechanism of burning involves an O induced pyrolysis of the alcohol followed by oxidation of the ultimate pyrolysis products, H_2, CO, and C particles.

11693* Studies in the Mechanism of Coke Formation. IV. Influence of Rate of Heating, Screening, etc., on the Plastic & Coking Properties of Coal. S. R. Ghosh, N. N. Das Gupta, and A. Lahiri. *Journal of Scientific & Industrial Research,* v. 16B, Feb. 1957, p. 89-95.

With a higher rate of heating, maximum fluidity, plastic temperature range, and temperatures of maximum fluidity and solidification of coals increase. However, a shortening of the "period of fused state" adversely affects these advantages.

11694 A Theory of Inflammability Limits and Flame-Quenching. D. B. Spalding. *Royal Society, Proceedings,* v. 240, ser. A, Apr. 24, 1957, p. 83-100.

Energy and diffusion equations are solved for a one-dimensional, laminar, steady combustion wave in a premixed gas which is in heat-transfer communication with solid surroundings.

11695 Interaction of a Free Flame Front With a Turbulence Field. Maurice Tucker. *U. S. National Advisory Committee for Aeronautics, Report* 1277, 1956, 19 p. (TL521 Un3r Vis.)

Small-perturbation spectral-analysis techniques are used to obtain the root-mean-square flame-generated turbulence velocities and the attenuating pressure fluctuations stemming from interaction of a constant-pressure flame front with a field of isotropic turbulence in the absence of turbulence decay processes.

11696 Propagation of a Free Flame in a Turbulent Gas Stream. William R. Mickelsen and Norman E. Ernstein. *U. S. National Advisory Committee for Aeronautics, Report* 1286, 1956, 26 p. (TL521 Un3r Vis.)

Effective flame speeds of free turbulent flames were measured by photographic, ionization-gap, and photomultiplier tube methods, and were found to have a statistical distribution attributed to the nature or the turbulent field.

See also: **11433** (H or CO flames with N_2O); **11827** (pipeline steels).

GEOLOGY, GEOPHYSICS, MINERALOGY, AND MINING ENGINEERING

11697 Role of the Earth Satellite in Four Important IGY Experiments. R. W. Porter. *Aeronautical Engineering Review,* v. 16, May 1957, p. 89-93.

Tasks are: measurement of the solar ultra-violet radiation at 1216 A.; measurement of the earth's magnetic field; cosmic ray analysis; determination of the terrestrial energy balance.

11698 Determination of the Composition of Plagio-Clase Feldspars by Means of Infrared Spectroscopy. C. Sheldon Thompson and Milton E. Wadsworth. *American Mineralogist,* v. 42, May-June 1957, p. 334-341.

The positions of the symmetry mode in the plagioclase feldspars giving rise to an absorption band in the 15.4-16.2 micron region of the infrared spectrum is a direct indication of composition.

11699 Uranium and Thorium in the Accessory Allanite of Igneous Rocks. William Lee Smith, Mona L. Franck, and Alexander M. Sherwood. *American Mineralogist,* v. 42, May-June 1957, p. 367-378.

Accessory allanite was separated from phanerocrystalline igneous rocks and its optical properties and radioactive components were compared. The birefringence was found to range from 0.015 to 0.021, the α-index of refraction from 1.690 to 1.775.

11700* (English.) **Be^7 Content in Snow.** Ragnar Nilsson, Kai Siegbahn, Adolf Berggren, and Björn Ingelman. *Arkiv för Fysik,* v. 11, no. 5, 1957, p. 445-451.

Concentration of Be^7 which is produced in the atmosphere by cosmic radiation was 4.3×10^3 atoms per cm^2.

11701* (English.) **The Uses of Artificial Satellite Vehicles. II.** H. E. Canney, Jr. and F. I. Ordway. *Astronautica Acta*, v. 3, no. 1, 1957, p. 1-15.

Considers the satellite as an observation and military base, a communications relay station, and a radar beacon and navigational fix.

11702* Recent Bathymetric Charts and Maps of the Southern Ocean and Waters Around Antarctica. H. F. P. Herdman. *Deep-Sea Research*, v. 4, Apr. 1957, p. 130-137.

11703 Uranium Investigations in Mohave County, Arizona. Olin M. Hart. *Division of Raw Materials, Salt Lake Exploration Branch (U. S. Atomic Energy Commission)*, RME-2029, Feb. 1955, 18 p. (TN21 Un3.1r Contin.)

Reconnaissance investigations disclosed an apparent relationship of U mineralization with post-Paleozoic intrusives which occur sporadically along large north-south trending faults. The U minerals occur in Pb-Zn veins within the intrusives, disseminated through the intrusive mass, or in veins in close proximity to the intrusives.

11704 Exploration for Nuclear Raw Materials. Robert D. Nininger, editor. 293 p. 1956. D. Van Nostrand Co., Princeton, N. J. (TN270 N62e)

A summary of papers from the Geneva Conference which concern U and Th geology and exploration.

11705* Origin of Marine-Terrace Deposits in the Santa Cruz Area, California. William C. Bradley. *Geological Society of America, Bulletin*, v. 68, Apr. 1957, p. 421-444 + 2 plates.

11706 *Illinois Mining Institute, Proceedings (Annual Volume)*, v. 56, 1956, 159 p. (TN1 I6p Vis.)

Includes papers on freeze-proofing of coal; low-cost barge loading installations; stripping machines and methods; safety practices; belt conveyors; and electrical controls in a coal preparation plant.

11707* An Index of Mineral Species & Varieties Arranged Chemically, With an Alphabetical Index of Accepted Mineral Names and Synonyms. Max H. Hey. 2nd Rev. Ed. 728 p. 1955. British Museum of Natural History, London. (QE355 H51i2 Ref.)

11708 The Present State of Knowledge Concerning the Lower Ionosphere. Arthur H. Waynick. *I.R.E., Proceedings*, v. 45, June 1957, p. 741-749.

Data include electron density as functions of height and time, dissipative processes, the possible atmospheric constituents involved and their distributions, physical parameters to be considered, and solar radiations and other factors.

11709* Rain Scavenging of Radioactive Particulate Matter From the Atmosphere. S. M. Greenfield. *Journal of Meteorology*, v. 14, Apr. 1957, p. 115-125.

On the basis of Langmuir's theory of collection efficiencies, a model is derived to explain the removal of radioactive particulate matter from the atmosphere by rain.

11710* The Influence of Finite Observation Intervals on the Measurement of Turbulent Diffusion Parameters. Y. Ogura. *Journal of Meteorology*, v. 14, Apr. 1957, p. 176-181.

11711 Factors Affecting Well Productivity. I. Drilling Fluid Filtration. E. E. Glenn, M. L. Slusser, and J. L. Huitt. **II. Drilling Fluid Particle Invasion Into Porous Media.** E. E. Glenn and M. L. Slusser. *Journal of Petroleum Technology*, v. 9; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 210, May 1957, p. 126-139.

11712 Minerals and the Microscope. H. G. Smith. (Rev. by M. K. Wells.) 4th Ed. 148 p. 1956. Thomas Murby & Co., London. (QE364 S58m4)

Principles of petrography; the petrological microscope; petrographic data on various rocks and minerals.

11713 Effect of Rate on Oil Recovery by Water Flooding. J. K. Jordan, W. M. McCardell, and C. R. Hocott. *Oil and Gas Journal*, v. 55, May 13, 1957, p. 98 + 28 pages.

Histories of completed floods, search of the technical literature, and laboratory analyses indicate that high rates of injection with capacity production are not necessary to obtain maximum ultimate recovery. Water floods can be curtailed without loss of oil recovery.

11714 Ore Microscopy. Sigmund L. Smith. 278 p. 1957. Sturm & Smith, Tucson, Arizona. (TN565 SM6502)

Microscopes; interference colors and figures; specimen preparation and identification; sampling; thin sections.

11715 Soap-Oil Systems for Formation Fracturing. A. R. Hendrickson, L. E. Nesbitt, and B. D. Oakes. *Petroleum Engineer (Management Ed.)*, v. 29, May 1957, p. B58 + 3 pages.

Sodium soaps added to fracturing oils lower fluid loss, increase sand-carrying capacity, and improve fluid viscosity.

11716 Principles of Engineering Geology and Geotechnics. Dimitri P. Krynine and William R. Judd. 730 p. 1957. McGraw-Hill, New York. (TN260 K94p)

Geology, soil and rock mechanics, and other earth sciences as used in civil engineering.

11717* Economics and Prediction of Oil Recovery by Secondary Methods. Paul D. Torrey. *Producers Monthly*, v. 21, May 1957, p. 33 + 8 pages.

11718 Summarized Records of Deep Wells in Pennsylvania, 1950-1954. Chas. R. Fettke. 114 p. 1956. Pennsylvania Geologic Survey, Bureau of Publications, Harrisburg. (QE157 P38.7bm Vis.)

Skeletal well records for 718 wells are presented and their locations shown on a map at 1:250,000 scale.

11719* The Natural Distribution of Radiocarbon and the Exchange Time of Carbon Dioxide Between Atmosphere and Sea. Harmon Craig. *Tellus*, v. 9, Feb. 1957, p. 1-17.

The average annual exchange flux of CO_2 into the sea is about 2×10^{-8} moles per sq. cm. of sea surface. An atmospheric residence time of 7 yrs. was found. The average residence time of CO_2 in the deep sea is estimated as not more than 500 yrs.

See also: **11075** (clay mineralogy); **11549** (geomagnetic non-dipole field); **11862** (corrosion in oil wells); **11873** (corrosion of well casing); **12123** (radioactive fallout).

GRAPHIC ARTS

11720* Possibilities of Electrical Etching. John J. Fisher. *American Photo Engraver*, v. 49, May 1957, p. 433-434.

Step-by-step processing with the well-known but little-used process in photo-engraving.

11721 Automation in Color Processing. Donald C. Gresham. *Gravure*, v. 3, May 1957, p. 23-24.

The McCorquodale-Gresham technique is standardized by new equipment.

11722* High Speed Photography. J. S. Courtney-Pratt and D. P. C. Thackeray. *Journal of Photographic Science*, v. 5, Mar.-Apr. 1957, p. 32-42.

Drum cameras; image dissection cameras; image converter tube photography; image splitting devices; light sources.

11723 Manual of Office Reproduction. Reproduction Processes, Systems Duplicating, and Imprinting Methods. Irvin A. Herrmann. 210 p. 1956. Office Publications Co., New York. (Z48 H43m)

Carbon paper; hectograph, fluid, stencil, relief, and offset duplicating; photocopying; automatic data processing and transmission; signature and addressing machines.

11724* Xerography and the IBM Electrostatic Printers. W. D. Bolton and W. E. Goetz. *Photographic Engineering*, v. 7, nos. 3-4, 1956, p. 137-146.

Functions and organization of automatic business machines utilizing the xerographic process. Some new process features in xerographic image development, transfer, and fixing. Optical systems and illumination requirements.

11725* The Effect of Salt Baths on Hypo and Silver Elimination. R. W. Henn, Nancy H. King, and J. I. Crabtree. *Photographic Engineering*, v. 7, nos. 3-4, 1956, p. 153-164.

The thiosulfate ion, which is ordinarily tenaciously absorbed to alum-hardened gelatin, is displaced rapidly when the film is bathed in certain salt solutions previous to washing. Most salts have some effect, but those containing a polyvalent anion are the most effective.

11726* Factors Involved in the Rapid Development of Motion-Picture Positive Film, and Their Dependence on Temperature. L. J. Fortmiller, N. A. Exley, C. E. Ives, and T. H. James. *Photographic Engineering*, v. 7, nos. 3-4, 1956, p. 171-181.

11727 Moving-Plate Camera for Nuclear Research. W. K. Dawson and B. W. Sargent. *Review of Scientific Instruments*, v. 28, May 1957, p. 337-341.

Camera is suitable for investigating the angular and energy distributions of photoprotons.

11728* (Russian.) Physico-Chemical Properties of Triacetate Movie Film and Film Bases at Elevated Temperatures. **Fiziko-mekhanicheskie svoistva triatsetatnoi kinoplenki i osnovy pri povyshennykh temperaturakh.** F. S. Sherman, B. N. Korostylev, and I. M. Fridman. *Tekhnika Kino i Televideniia*, no. 2, Feb. 1957, p. 54-58.

Tear resistance of triacetate film materials decreases with rising temperature to a greater extent than that of film materials based on nitrocellulose.

See also: **11237** (cyanine photographic sensitizers); **11582** (image dissector for high-speed cinematography); **12199** (photographic coincidence method).

HEAT POWER

11729* (Russian.) Heat Exchange in the Herring-Bone Fastening Zone of Rotating Turbine Vanes. **O teploobmene v. zone elochnykh khvostovikov rabochikh lopatok turbin.** I. T. Shvetz, E. P. Dyban, and O. A. Gerashchenko. *Akademii Nauk Ukrains'koi RSR, Dopovidi*, no. 1, 1957, p. 38-41.

11730 A Combustion System for Spark-Fired Gas Engines Using Diesel Compression Ratios. L. D. Thompson, R. H. Beadle, and F. A. Blake. *ASME, Transactions*, v. 79, May 1957, p. 815-821.

Jet ignition coupled with diesel compression ratios results in a versatile engine having high thermal efficiency and simple controls.

11731* Engines You May Never See. *Diesel Power*, v. 35, May 1957, p. 28-29.

The Waukesha model CFR-48 test engine and the Caterpillar test engine are described. These engines are used to determine diesel fuel performance.

11732* Unique Engine Tested. *Diesel Power*, v. 35, May 1957, p. 36-37.

A 75 lb. opposing piston diesel engine which generates 50 hp. at 8000 r.p.m. is described.

11733* Nomogram for Steam Condenser Design. J. P. Duncan. *Engineer*, v. 203, Apr. 26, 1957, p. 642-644.

11734 Automatic Control of Steam Generating Plant. *Fuel Efficiency*, v. 5, Apr. 1957, p. 166-168.

Details the application of instrumentation to obtain fuel efficiency for boiler plant. (To be continued.)

11735 Flow Patterns for Predicting Shell-Side Heat Transfer Coefficients for Baffled Shell-and-Tube Exchangers. Rajeshwar K. Gupta and Donald L. Katz. *Industrial and Engineering Chemistry*, v. 49, June 1957, p. 998-999.

The shell side of an exchanger may be divided into three separate zones: longitudinal flow, cross flow, and an eddy zone. Correlation of eddy zone coefficients permits estimation of exchanger performance by considering each zone separately.

11736 Circumferential Inlet Distortions in Axial Flow Turbomachinery. Fredric Ehrich. *Journal of the Aeronautical Sciences*, v. 24, June 1957, p. 413-417.

An actuator disc type of analysis is carried out to determine the effect of a nonuniformity in the circumferential velocity profile entering an axial flow stage of turbomachinery. Results are given for compressor, turbine, and free wheeling stages as a function of wheel speed, stage loading, and mean stagger angle.

11737 The Solar Engine. An Analysis. Peter Courvoisier. *Mechanical Engineering*, v. 79, May 1957, p. 445-447.

A theoretical analysis of the solar engine, using the technique of the analog circuit. Deductions that pave the way to the design of engines for use in arid lands.

11738 Underwater Propulsion. Engineering Horsepower to Velvet Hooves. *Missiles and Rockets*, v. 11, May 1957, p. 71 + 4 pages.

Five possible torpedo propulsion systems are considered.

11739 Rocket Propellants for Underwater Missiles. Alfred J. Zaehringer. *Missiles and Rockets*, v. 11, May 1957, p. 91-93.

Problems of abrupt pressure change are considered.

11740* Plastic Rotor Blades for Turbojet Engines. John Kulp. *SPE Journal*, v. 13, June 1957, p. 27-29.

Preliminary tests indicate practical possibility of using heat-stable resin turbine blades.

See also: **11834** (steels for steam superheaters); **11855** (corrosion in marine boilers).

INFORMATION—PREPARATION AND DISSEMINATION

11741 Book Catalogues: Their Varieties and Uses. Archer Taylor. 284 p. 1957. Newberry Library, Chicago. (Z997 T21b)

The evolution of book catalogs and their past and present uses as bibliographical tools. Deals with catalogs listing books owned by private persons, institutions, booksellers, and publishers.

11742 The Use of Indexes for Searching Chemical Literature. G. J. C. Potter and Fred J. Bassett. *Chemistry in Canada*, v. 9, May 1957, p. 39-44.

Effective use of the subject, author, and patent indexes of the major abstract journals is explained, also the Richter and Hill systems of formula indexing.

11743 Chemical Engineering in the Soviet Union and Eastern Europe. II. F. E. Warner and H. Sawistowski. *Industrial Chemist*, v. 33, May 1957, p. 236-240.

Describes scientific and technological literature available in these countries.

11744 Scientific and Technical Literature of the U.S.S.R. III. Distribution and Availability. M. Hoseh. *Journal of Chemical Education*, v. 34, May 1957, p. 235-237.

Internal and foreign distribution of literature. Procedures for obtaining Soviet publications.

11745* The Need for Imagination and Skepticism When Making Literature Searches. T. E. R. Singer. *Record of Chemical Progress*, v. 18, no. 1, 1957, p. 11-29.

An analysis of difficulties in indexing and searching for names of people, things, and publications.

11746 A Note on the Writing of Scientific Papers and Theses. W. Hume-Rothery. *Research*, v. 10, May 1957, p. 168-176.

Some suggestions for making papers as interesting, clear, and concise as possible.

INSTRUMENTATION

11747* New Microscope Shows Metals' Atom Structure. Leo Seren. *Aviation Age*, v. 27, May 1957, p. 60-65.

The field emission microscope resolves dimensions of the order of three A.

11748* (French.) New Results in the Study of Temperature Variations of Electric Furnaces as a Function of Time and Power Applied. **Nouveaux résultats dans l'étude des variations de température des fours électriques en fonction du temps et de la puissance fournie.** Jacques Bréfort. *Chaleur & Industrie*, v. 38, Apr. 1957, p. 85-94.

A study of electric furnaces with a heating power varying from 33.5 w. to 40 kw., in order to improve the heat balance and solve the problem of accurately regulating temperature.

11749* (German.) Processes for Level Measurement and Control. **Verfahren der Standmessung und-regelung.** W. E. Frede. *Chemie-Ingenieur-Technik*, v. 29, Apr. 1957, p. 250-254.

Various ways of controlling liquid level.

11750* (German.) Determination of the Solids Content of Hot Waste-Gases Using an Electrical Micro-Balance. **Bestimmung des Feststoffgehaltes heisser Abgase mit der elektrischen Mikrowaage.** T. H. Gast. *Chemie-Ingenieur-Technik*, v. 29, Apr. 1957, p. 262-266.

11751* (German.) Apparatus for the Determination of the Explosion Limits of Vapour/Air Mixtures of Combustible Liquids. **Apparatur zur Bestimmung der Explosionsgrenzen von Dampf/Luft-Gemischen brennbarer Flüssigkeiten.** Gerhard Micus and Bernhard Taranczewski. *Chemie-Ingenieur-Technik*, v. 29, Apr. 1957, p. 275-277.

11752* (German.) The Diathermostat. **Der Diathermostat.** H. Umstätter. *Fette, Seifen, Anstrichmittel*, v. 59, Apr. 1957, p. 266-272.

With this device highly constant temperatures with a relatively high regulation frequency can be generated after a short heating-up period.

11753* The Plastometer—A New Development in Continuous Recording and Controlling Consistometers. Dave Eolkin. *Food Technology*, v. 11, May 1957, p. 253-257.

Instrument is a differential shear type flow bridge capable of continuously measuring consistency.

11754 Furnace Atmosphere Analyzers. Wayne L. Besselman. *Industrial Heating*, v. 24, May 1957, p. 900 + 12 pages.

Principles governing the operation of analyzers for the measurement and control of furnace and generator atmospheres.

Measurement of dew point, CO, CO_2, CH_4, oxygen, carbon potential, total combustibles, and specific gravity.

11755 Electronic Instrumentation of a Device to Automatically Count and Size Particles in a Gas. E. S. Gordon, D. C. Maxwell, Jr., and N. E. Alexander. *Institute of Radio Engineers, Transactions on Instrumentation*, v. I-6, Mar. 1957, p. 27-35. (TK1 In6.6i Contin.)

Particles from 1 to 64μ in diameter and counting rates up to 100 particles per sec. are handled by the instrument.

11756* Electronic Level Control and Indication. V. Thomas and J. Wyatt. *Instrument Practice*, v. 11, Apr. 1957, p. 361-366.

Some instruments and their applications.

11757 Instrument Technology. v. I. Measurement of Pressure, Level, Flow, and Temperature. v. II. Analysis Instruments. E. B. Jones. 315 and 208 p. 1953 and 1956. Butterworths Scientific Publications, London. (TA165 J71i)

11758 Theoretical Considerations on Performance Characteristics of Solar Furnaces Nevin K. Hiester, Thomas E. Tietz, Eugene Loh, and Pol Duwez. *Jet Propulsion*, v. 27, May 1957, p. 507 + 7 pages.

Calculations of the heat flux and the maximum temperature obtainable at the focus are presented for furnaces of different diameter-to-focal length ratios. A paraboloid of relatively low quality is capable of achieving temperatures over 2000 K.

11759 A Low Temperature Scale From 4 to 300° in Terms of a Gold-Cobalt *Versus* Copper Thermocouple. N. Fuschillo. *Journal of Physical Chemistry*, v. 61, May 1957, p. 644-646.

A low temperature scale was obtained by comparing the e.m.f. from the Au + 2.1 at.% Co *vs.* Cu thermocouple with the temperature values obtained from a constant-volume He gas thermometer.

11760 A Photoelectric Particle Counter for Use in the Sieve Range. T. Beirne and J. M. Hutcheon. *Journal of Scientific Instruments*, v. 34, May 1957, p. 196-200.

Counter was designed for rapid measurement of the number of particles per gram in sieved fractions of opaque powders. It can also be used for determination of the size distribution of a powder in the sieve range in terms of numbers of particles.

11761 A Synthesizer for Triangular Wave Functions. Dan McLachlan. *Journal of Scientific Instruments*, v. 34, May 1957, p. 201-203.

An optical analog computer for summing the Fourier series necessary in computing electron densities of crystals from X-ray data.

11762 Design of the Quartermaster Solar Furnace. John M. Davies and Eugene S. Cotton. *Journal of Solar Energy Science and Engineering*, v. 1, Apr.-July 1957, p. 16-22.

Design of furnace for producing a radiation flux sufficiently high to destroy materials and burn protected skin with exposure times shorter than one sec.

11763 The Design of the Heliostat Mirror for a Solar Furnace. Paul D. Jose. *Journal of Solar Energy Science and Engineering*, v. 1, Apr.-July 1957, p. 23-27.

Analysis of required size and shape as a function of: latitude, hrs. of operation, angular diameter of the sun, distance between the parabolic condenser and heliostat, and arrangement of the axes.

11764 Economic Factors in Furnace Design. Nevin K. Hiester, Thomas E. Tietz, and Robert E. De La Rue, Jr. *Journal of Solar Energy Science and Engineering*, v. 1, Apr.-July 1957, p. 28-43.

Theoretical and practical factors which affect the specific performance characteristics and costs of solar furnaces.

11765 A Solar Furnace for Research in Nonferrous Metallurgy. W. M. Tuddenham. *Journal of Solar Energy Science and Engineering*, v. 1, Apr.-July 1957, p. 48-51.

High temperature solar furnace was constructed using the 60-in. rhodium-plated mirror from an Army surplus searchlight.

11766 Designing Solar Furnaces for Specific Performance. Raymond Bliss. *Journal of Solar Energy Science and Engineering*, v. 1, Apr.-July 1957, p. 55-62.

Basic performance equations of a parabolic solar furnace are manipulated into graphical form convenient for purposes of estimation and design analysis.

11767 Materials and Surfaces for Solar Furnaces. Ralph H. Wight. *Journal of Solar Energy Science and Engineering*, v. 1, Apr.-July 1957, p. 84-93.

The silvered mirror, used with water-white plate glass gives the best reflector performance. A combination slumping, grinding, and polished technique was best for approximating a paraboloidal surface.

11768 Design Problems of a Solar Furnace. Nobuhei Hukuo and Hisao Mii. *Journal of Solar Energy Science and Engineering*, v. 1, Apr.-July 1957, p. 108-114.

Analysis of the energy concentration of solar radiation incident to the focal plane given by an ideal parabolic reflecting mirror. Effect on concentration of the solar radiation of the accuracy of the mirror, precision of the sun-tracking mechanism, and the precision related to the placing of the specimen.

11769 New Heating Element Material. *Metallurgia*, v. 55, May 1957, p. 239-240.

"Kanthal-Super" is intended for use at element temperatures as high as 1600 C and will tolerate heavy surface loads of 64 to 128 w. per sq. in. It is a powder metallurgical product, the chief components of which are Mo Si_2 and Si O_2.

11770 Simple Logarithmic Ratio-Recording Spectrophotometer Attachment. P. Hariharan and M. S. Bhalla. *Optical Society of America, Journal*, v. 47, May 1957, p. 378-381.

A double-beam system using a single photomultiplier tube operated in a logarithmic difference circuit to give direct readings of log transmittance.

11771 Common-Path Interferometer for Testing Purposes. J. Dyson. *Optical Society of America, Journal*, v. 47, May 1957, p. 386-390.

Two types of interferometer are described in which the reference beam follows the same path as the test beam.

11772 Some Considerations Affecting the Design of Interference Microscopes. J. Dyson. *Optical Society of America, Journal*, v. 47, June 1957, p. 557-562.

11773 High Stability Nuclear Magnetic Resonance Spectrograph. Edward B. Baker and L. W. Burd. *Review of Scientific Instruments*, v. 28, May 1957, p. 313-321.

Spectrograph using an electromagnet is superstabilized by a feedback loop which uses the error signal from a secondary nuclear resonance probe to control the oscillator driving frequency. Means are provided for sweeping frequency to produce precalibrated spectra of high precision at various magnifications and scale shifts with a very convenient and rapid setup procedure.

11774 Thermistor Thermometer Bridge: Linearity and Sensitivity for a Range of Temperature. Kenneth S. Cole. *Review of Scientific Instruments*, v. 28, May 1957, p. 326-328.

For a small thermistor with a 2000-ohm resistance at 25 C, the slide position of a linear potentiometer is proportional to the thermistor temperature ± 0.5 C, and the deflection of a taut suspension pointer galvanometer is 20 ± 1 mm. per degree C over the temperature range from zero to 50 C with a maximum thermistor temperature rise of 0.05 C in still air.

11775 Small Induction Motor and Bearings for Operation in Liquid Helium. R. J. Donnelly. *Review of Scientific Instruments*, v. 28, May 1957, p. 351-353.

Small Teflon and Kel-F bearings operate in the temperature range below 80 K.

11776 (German.) Apparatus for Measuring the Depth of Cracks. **Erfahrungen mit Risstiefenmessern.** Lutz Brand. *Stahl und Eisen*, v. 77, May 2, 1957, p. 576-581.

Calibration curves of apparatus for determination of the depth of cracks at the surface of metals with the use of direct or alternate current. Variables influencing the scatter range of the curves. Comparison of measured results with true depths.

11777* Instrumentation Studies. LXXIX. Beta-Ray Gages. J. A. Van Den Akker, Keith W. Hardacker, and Leonard R. Dearth. *Tappi*, v. 40, May 1957, p. 179A-211A.

Types of gages; effects of static electricity in moving web of paper or paperboard; data on various commercial gages; sources of errors.

See also: **11220** (particle size measurement); **11376** (iron-sphere melting point apparatus); **11712** (microscopic petrography); **11714** (ore microscopy); **12090** (thickness gage); **12356** (microhardness tester).

LUBRICATION AND FRICTION

11778 Apparatus for Differential Thermal Analysis of Lubricating Greases. David B. Cox and James F. McGlynn. *Analytical Chemistry*, v. 29, June 1957, p. 960-963.

An automatic apparatus specifically designed for differential thermal analysis of lubricating greases is described. Experimental results reported include a re-examination of the phase change behavior of pure lithium stearate and a new phase diagram for the model grease system lithium stearate-*n*-hexadecane.

11779* What Makes a Modern Lube Oil? *Diesel Power*, v. 35, May 1957, p. 30-32.

Oil characteristics are related to results in actual service.

11780* (German.) New Ideas on the Frictional Properties of Polyamides. **Neue Erkenntnisse über Gleiteigenschaften von Polyamiden. I.** H. R. Jacobi. *Kunststoffe*, v. 47, May 1957, p. 234-239.

With the Almen-Wieland apparatus, curves are obtained which help to assess the effect of adding graphite and MoS_2 under various working conditions and with different combinations of the two materials. Increased knowledge of the morphological relationship led to the preparation of polyamides having a regular structure and extremely fine grain.

11781* Cam & Tappet Test for Lubricants. II. Wear Evaluation. E. H. Loeser, S. B. Twiss, and D. M. Teague. *Lubrication Engineering*, v. 13, May 1957, p. 269-274.

A lubricant tester, designed for the study of metal scuff under combined sliding and rolling contact with cyclic variation of load, can be used to evaluate wear before the scuffing occurs. The wear of cast-iron cams is decreased several fold by the addition to the oil of 0.75% of an anti-scuff additive, zinc dialkyl dithio-phosphate.

11782* The Effects of Nuclear Radiation on Lubricants. J. A. King and W. L. R. Rice. *Lubrication Engineering*, v. 13, May 1957, p. 279-283.

Effects of γ radiation on petroleum and synthetic-base hydraulic fluids, lubricants, and engine oils. Many of the materials tested appear satisfactory for use after exposure to 1×10^8 roentgens of γ radiation.

11783* Use of Rolling Contact Bearings in Low Viscosity Liquid Metal Lubricants. W. Markert, Jr. and K. Mildred Ferguson. *Lubrication Engineering*, v. 13, May 1957, p. 285-290.

Tests with bearings submerged in and lubricated by either liquid NaK, or liquid Na. Mechanism of bearing failure.

11784* (Russian.) Wear Resistance of Carbon- and High-Chromium Steels. **Iznosostoikost' uglerodistykh i vysokokhromistykh stalei.** D. Ia. Vishniakov and A. G. Vinitskii. *Metallovedenie i Obrabotka Metallov*, no. 4, Apr. 1957, p. 2-9.

Wear intensity depends on the composition and structure of the steel. An increase in quantity of carbides results in increased wear resistance.

11785* Evaluation of Grease Lubricated Bearings at High Rotative Speeds. J. R. Roach and T. B. Jordan. *Spokesman*, v. 21, May 1957, p. 18-22.

The performance life of grease lubricated bearings decreases with increase in DN value (bore diameter in mm. x speed in r.p.m.) and in temperature. The effect of metallic vs. non-metallic bearing retainers and of outer race-riding vs. inner race-riding retainers on performance life is illustrated.

11786* A Theory of Thixotropy and Its Application to Grease. S. J. Hahn, T. Ree, and H. Eyring. *Spokesman*, v. 21, June 1957, p. 12-20.

The theoretical flow equations are applied to the experimental flow curves of the systems; rubber dissolved in toluene, nitrated American raw cotton dissolved in butyl acetate, nitrated pine pulp in butyl acetate, melted sulfur, gelatine sol, melted cholesteryl butylate, and Grease S.

11787* KELF No. 90 Grease. A Chemically and Thermally Stable Fluorocarbon Lubricant. R. J. Seffl, F. W. West, and F. J. Honn. *Spokesman*, v. 21, June 1957, p. 22-25.

In the plant, this grease is finding application in plug cocks, valve stems, threads, packing glands, bearings, O-ring seals, agitator and pump shafts, and many related types of equipment where heat and chemical resistance must be combined with lubricating properties.

11788 Lubrication. A Study of Its Action in Continuous Metal Deformation. I. L. H. Butler. *Steel Processing and Conversion*, v. 43, May 1957, p. 269 + 7 pages.

Friction mechanism and theory; types of lubrication, requirements of lubricants for metal-deformation processes. (To be continued.)

11789* (Norwegian.) Lubricants in Industry. **Smøremidler i industrien.** Hans Goksøyr. *Teknisk Ukeblad*, v. 104, May 2, 1957, p. 363-366.

A study of modern requirements for lubricants. Hydrodynamic and boundary lubrication. Antifriction metals; types of bearing surfaces. Effects of additions of methacrylate polymers, polar molecules, silica polymers, phosphates, latex, and aromatic substances on the properties of lubricants.

11790* (Russian.) Resistance of Metals to Scoring. **Stoikost' metallov protiv zadiraniia.** A. V. Ratner. *Teploenergetika*, v. 4, May 1957, p. 30-35.

Results of tests on several materials as to their resistance to scratching. The reasons for this wear are analyzed. A relationship is determined between the relative increase in surface hardness and the resistance of materials to scoring.

See also: **11775** (Teflon bearings); **11797** (hydraulic fluids); **11816** (wear of high-temperature shaft seals); **11819** (Al-Sn bearing metals); **12010** (wear of cutting tools); **12012** (wear of WC tools).

MECHANICAL ENGINEERING

11791* A Reduction Method for Buckling Problems of Orthotropic Plates. P. Shuleshko. *Aeronautical Quarterly*, v. 8, May 1957, p. 145-156.

Plates with simply-supported ends and various boundary conditions at the sides with uni-axial and bi-axial loading are considered and the necessary reduction equations given.

11792 Thermal Stresses in Disks of Constant Thickness. J. F. Norbury. *Aircraft Engineering*, v. 29, May 1957, p. 132-137.

For a given temperature difference between the inner radius and the periphery of a disk of constant thickness, the effect of temperature profile on stresses is investigated by assuming a power law temperature distribution and varying the exponent.

11793* (Russian.) Application of the Method of Photoelasticity for the Analysis of Buckled Plates. **O primenenii metoda fotouprugosti dlia issledovaniia vypuchennykh plastinok.** Kh. K. Aben. *Akademii Nauk Estonskoi SSR, Izvestiia*, v. 6, no. 1, 1957, p. 28-40.

The common transmission polariscope is used.

11794* Tables for Circularly Curved Horizontal Beams With Symmetrical Uniform Loads. Martin Schulz and Mauricio Chedraui. *American Concrete Institute, Journal*, v. 28, May 1957, p. 1033-1040; *ACI Proceedings*, v. 53, 1957, p. 1033-1040.

Tables simplify and expedite the engineer's task of calculating circular beams without developing the formulas.

11795 The Analysis of Structures. Nicholas John Hoff. 493 p. 1956. John Wiley & Sons, New York. (TG260 H67a)

Methods based on the minimal principles and the principle of virtual displacements. Buckling loads. Determination of stresses in aircraft fuselages.

11796 Analytical Mechanics of Gears. Earle Buckingham. 546 p. 1949. McGraw-Hill, New York. (TJ184 B85a)

A mathematical analysis designed to clarify the nature of the action and contact between the contacting teeth of the different types of gears.

11797* Fire-Resistant Hydraulic Fluids. II. Aqueous Base Types. W. H. Millett. *Applied Hydraulics*, v. 10, June 1957, p. 124 + 3 pages.

Properties, installation, and control of aqueous-base fluids.

11798* (German.) Slip-Ring Packings for Centrifugal Pumps in Chemical Industry. **Gleitringdichtungen für Kreiselpumpen der chemischen Industrie.** Rudolf Schaffer. *Chemie-Ingenieur-Technik*, v. 29, Apr. 1957, p. 241-249.

Use of the slip-ring seal for sealing crank guides in centrifugal pumps. Materials of construction; permissible pressures and temperatures.

11799* Linear Induction Pumps for Liquid Metals. A. S. Fenemore. *Engineer*, v. 203, May 17, 1957, p. 752-755.

Advantages include complete and stable control of the pump output, obtained by variation of the applied voltage, and substantially constant output pressure throughout each time cycle.

11800* Modernized Handling—Tonic for a Lagging Industry. Stanley S. Greene. *Flow*, v. 12, May 1957, p. 63-77.

Heavy-duty handling over crowded work areas; in-and-out flow of hard-to-handle shapes. Uninterrupted movement through high-volume production in the textile industry.

11801 How to Design for Sound Stainless Steel Castings. J. L. Lessman. *Foundry*, v. 85, June 1957, p. 114-117.

11802 Bending and Buckling of Clamped Sandwich Plates. G. A. Thurston. *Journal of the Aeronautical Sciences*, v. 24, June 1957, p. 407-412.

The Lagrangian multiplier method is applied to Hoff's energy expressions for sandwich plates to derive equations for finding the deflections and buckling loads of rectangular plates clamped on all four edges.

11803 Buckling Under External Pressure of Cylindrical Shells Evenly Stiffened by Rings Only. P. P. Bijlaard. *Journal of the Aeronautical Sciences*, v. 24, June 1957, p. 437 + 11 pages.

Panel buckling stress is calculated by determining the length of the equivalent simply supported shell, taking account of the rotational restraints offered by the rings. Rotational spring constants are calculated for rings with plate and box sections.

11804 Hydraulic Actuating Systems. B. Saelman. *Machine Design*, v. 29, May 16, 1957, p. 131-134.

How to design for minimum weight and high efficiency.

11805 Friction Drive for Precision Positioning. L. A. Smitzer. *Machine Design*, v. 29, May 30, 1957, p. 73-75.

Design factors and principles in the development of a friction clutch system for precision control of starting and stopping.

11806* Calculating Stress Pressures on Walls of Rigid Containers. Raymond R. Haugh. *Package Engineering*, v. 2, May 1957, p. 40-42.

Computers calculate the stress pressure in lbs. per sq. in. on the walls of rigid airtight containers due to the temperature changes inside the container plus pressure changes outside caused by different altitudes.

11807 The Plastic Methods of Structural Analysis. B. G. Neal. 353 p. 1956. John Wiley & Sons, New York. (TG260 N25p)

Principles and basic theorems. Estimate of deflections; factors affecting the plastic moment. Minimum weight design. Variable repeated loading.

11808 Hydraulic Control Valves. IV. Directional Valves. John J. Pippenger. *Product Engineering*, v. 28, May 1957, p. 167-173.

Four-way valve spool design and typical circuit applications when ports are blocked, open, throttled, or variously interconnected in the neutral position.

11809 How to Determine Mass Moments of Inertia for Irregular Parts. D. M. Ellett. *Product Engineering*, v. 28, May 1957, p. 184-187.

Three pendulum systems for determining precise values with known error.

11810* Transient Stresses in Beams of Variable Characteristics. A. Robinson. *Quarterly Journal of Mechanics and Applied Mathematics*, v. 10, May 1957, p. 148-159.

For a disturbance which is produced by a concentrated impulse, the bending moment is discontinuous even across the fronts of the shear waves.

11811* (French.) Pressure Vessel Design. **Calcul des réservoirs à pression.** *Soudage et Techniques Connexes*, v. 11, Mar.-Apr. 1957, p. 101-109.

Account is taken of a "design stress" determined from the properties of the materials used.

11812 (Czech.) Calculating the Strength Values of Tube Plates of Heat Exchangers. **Pevnostní výpočet trubkovnic výměníků tepla.** V. Houžvic. *Strojírenství*, v. 7, Apr. 1957, p. 243-248.

11813* (English.) **Stresses in Rotating Disks With Noncentral Circular Holes.** Hideo Saitô. *Technology Reports, Tôhoku University*, v. 21, no. 2, 1957, p. 217-234.

Mathematical analysis.

11814 Buckling of Shallow Spherical Shells Under External Pressure. Edward L. Reiss. *U. S. Atomic Energy Commission, Research and Development Report,* NYO-7067, Apr. 1957, 23 p. (UF767 U3ny Contin.)

A formula for the initial buckling loads for clamped, shallow spherical shells under uniform external pressure is obtained by combining the solutions of two linearized versions of the original nonlinear problem. One of these versions is a linear eigenvalue problem, while the other is the bending problem for a shallow cap in the linear theory of elasticity.

11815 Local Stresses in Spherical Shells From Radial or Moment Loadings. P. P. Bijlaard. *Welding Journal,* v. 36, May 1957, p. 240s-243s.

Design information on deflections, bending moments and membrane forces, from radial loads and moments acting on a cylindrical attachment, and on the influence of simultaneous internal pressure.

11816 Evaluation of Designs and Materials for High Speed—High Temperature Shaft Seals for Turbojet Engine Applications. Ernest J. Taschenberg, et al. *Wright Air Development Center, Power Plant Laboratory, WADC Technical Report* 56-267, May 1956, 66 p. (TL507 Un3.18w Vis.)

A large number of materials were investigated to determine those having promising wear characteristics at room temperatures and at high temperatures.

11817* (English.) **Stresses in Certain Thin Elastic Plates Rotating About Normal Axes.** A. M. Sen Gupta. *Zeitschrift für Angewandte Mathematik und Mechanik,* v. 37, Jan.-Feb. 1957, p. 27-34.

The problem of a rotating thin plate having a regular curvilinear polygonal boundary is solved.

See also: **11633** (packaging studies); **11663** (design of torpedoes); **11738** (torpedo propulsion systems); **11831** (selection of gear steels); **11918** (design of castings); **12007** (design of stampings); **12009** (machine tool data); **12455** (design of foundations).

METALLURGY

11818 (English.) **Alloy Steel Castings.** *Aciers Fins & Spéciaux Francais,* no. 25, Mar. 1957, p. 27-34.

Composition and properties of various manganese, engineering-alloy, stainless, and heat-resisting steels.

11819* (German.) New Developments in Aluminum-Tin Alloys. **Neue Entwicklungen auf dem Gebiet der Aluminium-Zinn-Lagerlegierungen.** E. S. Hedges. *Aluminium,* v. 33, May 1957, p. 318-322.

Aluminum-tin base bearing metals are excellent, but require the finest possible grain structure.

11820* Material Requirements of the Australian Aircraft Industry. H. E. Arblaster. *Australasian Engineer,* v. 49, Mar. 1957, p. 47-55.

Properties of various aricraft steels, stainless steels, and Mg alloys are compared. (To be continued.)

11821* Stainless Steel—Its Properties and Machining. I. J. A. Ferree. *Automatic Machining,* v. 18, May 1957, p. 61-64.

Properties of stainless steel as they affect the use of the material, and as they affect machining of the various grades. (To be continued.)

11822* Principal Types of Cast Iron and Broad Spheres of Application. J. G. Pearce. *British Cast Iron Research Association, Journal of Research and Development,* v. 6, Apr. 1957, p. 521-529.

Reviews the principal types of flake graphite, nodular, and special cast irons now available to the engineer and designer.

11823* Aluminum-Clad Copper Magnet Wire for Elevated-Temperature Use. C. L. Carlson. *Electrical Manufacturing,* v. 59, June 1957, p. 164-167.

Composite wire combines the electrical conductivity of Cu with the oxidation resistance of Al. In the range of 100 to 300 C the loss of current-carrying ability is less than that of Cu.

11824 Metallurgical Problems of Atomic Energy. L. Rotherham. *Institute of Metals, Journal,* v. 85, May 1957, p. 393-396.

A short account is given of metallurgical problems arising in connection with structures, fuels, and special metals requirements.

11825 Columbium and Its Uses. G. L. Miller. *Materials & Methods,* v. 45, May 1957, p. 131-135.

Discovery of large reserves of Cb ores in Africa greatly expands the potential usefulness of this metal, particularly in nuclear energy installations and high temperature equipment.

11826 New Ultra High Strength Steel. Samuel J. Rosenberg and Carolyn R. Irish. *Materials & Methods,* v. 45, May 1957, p. 145-146.

A high Si, Ti modification of 4340 retains ductility for structural applications when heat treated to a strength of 285,000 psi.

11827 Pipeline Steels. A. B. Wilder and A. F. Aebersold. *Mechanical Engineering,* v. 79, May 1957, p. 448-453.

A review of the development of the industry with an analysis of current and future trends. Covers production, chemical composition, and properties.

11828 Metals for Fast Flight. *Metal Progress,* v. 71, May 1957, p. 65 + 6 pages.

Discusses possibilities for development of metals strong enough for 2400 mi. per. hr. speed, which are unknown at present.

11829 Heat Tolerant Metals for Aerodynamics. William M. Canterbury. *Metal Progress,* v. 71, May 1957, p. 99-100.

Problems and requirements of metals for turbine blades and rocket engines.

11830* (Dutch.) Copper and Copper Alloys. **Koper en koperlegeringen. XVI.** Malleable Aluminum Copper Alloys. **Aluminiumkoper kneedlegeringen.** W. G. R. de Jager. *Metalen,* v. 15, Apr. 1957, p. 135-137.

Structure and heat treatment of Al-Cu alloys. Effect of tempering temperature on properties of an Al-Cu alloy containing about 10% Al. Effects of addition of other metals. (To be continued.)

11831* (French.) The Choice of Gear Steels and Their Heat Treatment. **Le choix des aciers pour engrenages et leurs traitements thermiques.** O. Patterman. *Métallurgie et la Construction Mécanique,* v. 89, Apr. 1957, p. 337 + 5 pages.

Characteristics of gear steels. Appropriate heat treatments. Nomenclature of Pompey and Roll steels. Effect of the mass of work pieces on their characteristics. (To be continued.)

11832* Titanium—Today and Tomorrow. Kim Darby. *Modern Metals,* v. 13, May 1957, p. 84 + 10 pages.

Up-to-date appraisal of the Ti industry reveals advances in sponge production, melting, and fabricating in past 10 yrs. Industry growth; new applications.

11833 Oxidation Resistant Silicon Aluminium Steels. E. A. Brandes. 40 p. 1956. Fulmer Research Institute Limited, Stoke Poges, Buckinghamshire, England. (TA479.55 B73O)

Steels containing 2-3% Si with 0.5 to 1% Al are comparable in resistance to oxidation at temperatures up to 900 C with 18% Cr, 8% Ni austenitic steel. Such steels have adequate ductility at room temperature to permit many metal-forming operations, and ductility is not reduced by oxidation at temperatures up to 900 C. Scaling resistance in flue gas and steam is superior to mild steel and is further improved by Al coatings.

11834* (Polish.) The Use of Other Elements in Place of Molybdenum in Steels for Steam Superheater Tubes. **O możliwości zastąpienia molibdenu innymi pierwiastkami w stalach na rury przegrzewaczy pary.** W. Tomaszczyk. *Prace Instytutów Ministerstwa Hutnictwa,* no. 1, 1957, p. 13-40.

Chromium-molybdenum steel can be replaced by Cr-Mo-V or Cr-W-V steel; Mn-Si steels are second choice.

11835 More Colors for Copper. *Steel,* v. 140, May 13, 1957, p. 141 + 4 pages.

Depending on composition, Cu alloys range from natural red-gold through blue, black, and green. Colors can be changed by varying composition, treatment, and coatings. Final appearance depends on mill finish, polishing and buffing techniques, annealing, and grain size.

11836 Development of Cast Iron-Base Alloys of Austenitic Type for High Heat-Resistance and Scale-Resistance. F. Eberle, J. H. Hoke, and W. E. Leyda. *Wright Air Development Center, WADC Technical Note* 55-290, pt. 2, Jan. 1957, 86 p. (TL507 Un3.18t Contin.)

Iron-base alloys with a minimum Fe content of 45% may possess creep-rupture properties at temperatures of 1600-1800 F approaching those of the Co-base alloy H.S. 21. Such Fe-base alloys are equal to H.S. 21 in oxidation resistance at 2000 F, but inferior in short-time tensile strength, cold ductility, and in resistance to thermal fatigue or thermal shock.

11837* (German.) Conditions of Formation and Properties of β-Tungsten. A Further Contribution to the Reduction of Tungsten Trioxide. **Über die Bidungsbedingungen und Eigenschaften des β-Wolframs. Weiterer Beitrag zur Reduktion des Wolframtrioxyds.** T. Millner, A. J. Hegedüs, K. Sasvári, and J. Neugebauer. *Zeitschrift für Anorganische und Allgemeine Chemie,* v. 289, Mar. 1957, p. 288-312.

A study showing that β-W is neither a metallic oxide nor a hybrid, but a metal. X-ray examination of the conditions of production. A process for producing β-W. Chemical and physical properties. β-α-transformation and ensuing crystal growth.

See also: **10946** (metals for aircraft); **11074** (porcelain enameled Al panels); **11649** (Ni industry); **12207** (linear programming in alloy preparation).

METALS—CORROSION

11838 The Oxidation Characteristics of the Alkali Metals. I. The Oxidation Rate of Sodium Between −79 and 48°C. J. V. Cathcart, L. L. Hall, and G. P. Smith. *Acta Metallurgica,* v. 5, May 1957, p. 245-248.

The oxidation rate of sodium was measured at five temperatures: −79, −20, 25, 35, and 48 C. The reaction rate in dry oxygen was found to be small, and the oxide films were highly protective. The observed oxidation data were not quantitatively consistent with any of the previously proposed theoretical rate equations; however, the general shape of the rate curves corresponded qualitatively to that predicted by the Cabrera-Mott oxidation model. It is suggested that the inadequacies of this model may be attributable to the inhomogeneity of thin oxide films formed on metals.

11839 Aqueous Corrosion of Uranium and Uranium-6 w/o Zirconium Alloy. W. E. Ruther and W. B. Seefeldt. *Argonne National Laboratory (U. S. Atomic Energy Commission),* ANL-5672, Jan. 1957, 15 p. (UF767 Un3.1an Contin.)

Corrosion rates in boiling distilled water of reactor grade U subjected to heat treatments of 600, 720, 800, and 1000 C asymptotically approached the lower corrosion rate of high purity U. At a flow velocity of about 20 ft. per sec. of distilled water, U-6 w/o Zr alloy corroded at low, but increasing, rates at 60 and 90 C.

11840 Experiments in Corrosion Mechanism: Aluminum at High Temperatures. J. E. Draley and W. E. Ruther. *Argonne National Laboratory (U. S. Atomic Energy Commission),* ANL-5658, Apr. 1957, 26 p. (UF767 Un3.1an Contin.)

Resistance to disintegrating attack in high temperature water is shown to improve with the amount and dispersion of the cathodic second phase present in the Al alloys. Relative abilities of various second phases to protect the alloy against disintegration are in the same order as their abilities to act as effective cathodes at the temperature of testing.

11841 Studies of the Oxidation and Contamination Resistance of Binary Niobium Alloys. Chester T. Sims, William D. Klopp, and Robert I. Jaffee. *Battelle Memorial Institute (U. S. Atomic Energy Commission),* BMI-1169, Feb. 1957, 52 p. (UF767 U3b Contin.)

Alloys containing up to 35 a/o Ti, Cr, and Zr, 25 a/o V, Mo, Tl, and W, and 5 a/o Be, B, Co, Fe, Mn, Ni, and Si were investigated in air at 600, 800, and 1000 C. The elements Ti, V, Mo, and Cr improved oxidation resistance.

11842* (French.) Intergranular Corrosion by Hydrochloric Acid of Aluminum Purified by the Zone-Melting Technique. **Sur la corrosion intergranulaire par l'acide chlorhydrique de l'aluminium purifié par la méthode de la "zone fondue".** Frédéric Montariol. *Comptes Rendus,* v. 244, Apr. 15, 1957, p. 2163-2166.

Effect of purity and heat treatment on corrosion of Al specimens in 22% HCl. The behavior of zone-purified metal (99.999%) was better than ordinary refined Al even when the purity of the latter approximated 99.994%.

11843 Titanium Corrosion and Inhibition in Fuming Nitric Acid. H. B. Bomberger. *Corrosion,* v. 13, May 1957, p. 287t-291t.

Sporadically rapid attack observed on Ti in red fuming HNO_3 may be associated with a limited air supply. Additions of air, oxygen, and certain salts resulted in noticeable corrosion inhibition. Attack in the uninhibited acid was found to be largely intergranular.

11844 The Corrosion Resistance of Ductile Iron in Sea Water and Petroleum Tanker Services. Michel Paris and B. de la Bruniere. *Corrosion,* v. 13, May 1957, p. 292t-296t.

Data on corrosion resistance of gray iron, steel, and ductile iron in sea water and acid solutions of different concentrations, are compared. Ductile iron pipe containing approximately 1.5% Ni is most satisfactory in tankers carrying crude petroleum from the Middle East.

11845 Corrosion Studies in High Temperature Water by a Hydrogen Effusion Method. M. C. Bloom, M. Krulfeld, W. A. Fraser, and P. N. Vlannes. *Corrosion,* v. 13, May 1957, p. 297t-302t.

Data on the corrosion rate of low carbon steel in distilled water at 600 F, the effect of raising the pH in such systems, and the effect of thermal shock, temperature rise, and heat treatment of the metal on corrosion rate.

11846 Theoretical Studies and Laboratory Techniques in Sea Water Corrosion Testing Evaluation. F. L. LaQue. *Corrosion,* v. 13, May 1957, p. 303t-314t.

11847 Inhibiting Effect of Hydrofluoric Acid in Fuming Nitric Acid on Corrosion of Austenitic Chromium-Nickel Steels. Clarence E. Levoe, David M. Mason, and John B. Rittenhouse. *Corrosion,* v. 13, May 1957, p. 321t-328t.

The rate of corrosion of welded and unwelded Cr-Ni, Uniloy 19-9 DL and 19-9 DX, and welded alloy 321 by fuming HNO_3 in the liquid and the gas phase was measured with and without HF added as a corrosion inhibitor.

11848 Corrosion by Low-Pressure Geothermal Steam. T. Marshall and A. J. Hugill. *Corrosion,* v. 13, May 1957, p. 329t-337t.

Results of corrosion tests in geothermal steam contaminated with chlorides, H_2S, and CO_2 are given for a range of common engineering alloys. Titanium and austenitic stainless steels (especially Mo-bearing varieties) were highly resistant.

11849 Some Observations on Cathodic Protection Criteria. L. P. Sudrabin and F. W. Ringer. *Corrosion,* v. 13, May 1957, p. 351t-357t.

A comparison of cathodic protection criteria was made on a 240 ft. length of bare 6-in. pipe (steel) buried in a 16,100 to 55,900 ohm. cm. soil.

11850* (French.) New Methods for the Study of Corrosion at a High Temperature. **Nouvelles méthodes d'étude de la corrosion à température élevée.** J. Brefort and G. Valensi. *Corrosion et Anticorrosion,* v. 5, Apr. 1957, p. 106-111.

Description of a new photo-voltaic-cell-type heat balance used in studying heterogeneous chemical kinetics and especially dry corrosion of metals and alloys at high temperatures.

11851* (French.) Behavior of Nickel and Its Alloys in the Presence of Halides. **Comportement du nickel et de ses alliages en présence des halogènes.** L. Arbellot. *Corrosion et Anticorrosion,* v. 5, Apr. 1957, p. 112-118.

Corrosion resistance of pure Ni, monel (68% Ni, 27% Cu), inconel (80% Ni, 14% Cr, 6% Fe), stainless steel 18/8 (18% Cr, 8% Ni), and Ni-Mo alloys were compared with that of Cu, steel, and Al in halides up to 600 C.

11852* Cyclohexylamine Carbonate as a Volatile Corrosion Inhibitor. C. A. Rhodes. *Corrosion Prevention and Control,* v. 4, Apr. 1957, p. 37 + 3 pages.

CHC gives almost immediate protection in an enclosed space due to its relatively high rate of volatility. Its effectiveness at a distance makes it particularly useful where it is desired to protect a large number of small articles of uneven surface or objects in large enclosed spaces.

11853 Kinetics of the Oxidation of Chromium. Earl A. Gulbransen and Kenneth F. Andrew. *Electrochemical Society, Journal,* v. 104, June 1957, p. 334-338.

The oxidation of high purity Cr was studied over the temperature range 700 to 1100 C using the vacuum microbalance method. Below 900 C conventional oxidation curves were obtained which can be fitted to the parabolic rate law. Above 900 C and for a film thickness of approximately 4800 A., the rate of oxidation increased in an unusual manner.

11854 Reaction of Zirconium With Water Vapor at Subatmospheric Pressures. M. W. Mallett, W. M. Albrecht, and R. E. Bennett. *Electrochemical Society, Journal,* v. 104, June 1957, p. 349-352.

In the temperature range 300 to 600 C the reaction of Zr with water vapor at 33 mm. Hg pressure follows the cubic rate law with an activation energy of 29,700 cal. per mole. The mechanism of film formation is the same as that for the Zr-O reaction.

11855* Corrosion in Scotch Marine Boilers. I. Model Boiler Tests on the Corrosion of Mild Steel Tubes in Highly Saline Waters. F. Wormwell, G. Butler, and J. G. Beynon. **II. Model Boiler Tests on the Influence of the Copper Content of the Steel on the Corrosion of Tubes in Artificial Sea Water.** G. Butler and H. C. K. Ison. *Institute of Marine Engineers, Transactions,* v. 69, Apr. 1957, p. 109-128 + 1 plate.

11856* Progress Report on Research Project No. 37. Corrosion of Cast Steels. *Journal of Steel Castings Research,* no. 8, May 1957, p. 1-4.

Machining the surfaces of cast steel specimens of nine compositions had no significant effect on their corrosion resistance. Cast steels containing Ni, Mn, and Cr as alloy elements have corrosion resistance superior to cast steels containing Mn alone when exposed in any of the test environments.

11857* (German.) Velocity of Corrosion Processes. **Geschwindigkeiten der Korrosionsvorgänge.** W. Katz. *Metalloberfläche,* v. 11, May 1957, p. 145-154.

Corrosion without film-formation is a linear function of time, and the velocity is determined by concentration and diffusion in the solution toward the metal surface. In the case of corrosion with film formation, the varying nature of the metal surface is the determining factor, and corrosion varies nonlinearly with time.

11858 An Investigation Into the Catastrophic Corrosion of a Flake Graphite Cast Iron in Carbon Dioxide Containing a Small Amount of Carbon Monoxide. S. R. Billington and B. C. Woodfine. *Metallurgia,* v. 55, May 1957, p. 213-220.

The high rate of oxidation observed with a fine flake graphite pearlitic cast iron in a CO-CO_2 mixture at 525 C is attributed to the presence of undamaged graphite flakes in the scale and the very thin nonprotective nature of the outer oxide zone.

11859 The Dissolution of Tungsten in Mixtures of Hydrofluoric and Nitric Acids. D. Robbins. *Metallurgia,* v. 55, May 1957, p. 257-259.

Metal most readily dissolves in a mixture containing about 40% by volume concentrated HnO_3 and 60% concentrated HF.

11860 Corrosion Products Formed in the Reaction Between Fused Sodium Hydroxide and Iron-Rich Alloys of Iron, Chromium, and Nickel. G. P. Smith and E. E. Hoffman. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission),* ORNL-2156, May 1957, 8 p. (UF767 U3o Contin.)

A study of the microstructures of corrosion-product layers formed by the action of fused NaOH at 815 C on types of 304 and 347 stainless steel and on four high-purity alloys with nominal compositions of 80% Fe-20% Cr, 80% Fe-10% Cr-10% Ni, 74% Fe-18% Cr-8% Ni, and 60% Fe-20% Cr-20% Ni.

11861 The Effect of Irradiation on the Corrosion of Type 347 Stainless Steel by Uranyl Sulfate Solutions. F. H. Sweeton, M. D. Silverman, and H. O. Day. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission),* ORNL-2284, May 1957, 27 p. (UF767 U3o Contin.)

Reactor radiation above power-density level of 4 w/ml. causes a sharp rise in corrosion rate. Radiation effects are not observed until after an initial induction period, which depends on amount of previous nonradiation exposure. Effect of temperature is apparently minor in the range 250 to 290 C.

11862 How Corrosion Attacks Well Casing. Y. W. Titterington. *Oil and Gas Journal,* v. 55, May 27, 1957, p. 136 + 3 pages.

Cathodic protection has become a reliable and useful method of protecting well casing from external corrosion. Current requirements are determined from either downhole potential-drop surveys or wellhead-current-potential measurements.

11863* A Field Study of ACSR Cable in Severe Marine and Industrial Environment. E. W. Greenfield and E. W. Everhart. *Power Apparatus and Systems,* no. 29, Apr. 1957, p. 106-117.

Changes in electrical, mechanical, and chemical properties as caused by various climatological conditions are reported.

11864* (French.) Results of Atmospheric Corrosion Tests in Aluminum and Its Alloys in Italy. **Résultats d'essais de corrosion atmosphérique effectués en Italie sur l'aluminium et ses alliages.** Eugenio Hugony and Giuseppe Luft. *Revue de l'Aluminium,* v. 34, Apr. 1957, p. 379-393.

Factors considered include changes in the external aspect, reduction of the mechanical properties, and alterations in the microstructure.

11865* (German.) Cases of Metal Corrosion Caused by Hygroscopic Solids. **Über die durch hygroskopische feste Körper verursachten Metallkorrosionen.** A. Bukowiecki. *Schweizer Archiv für Angewandte Wissenschaft und Technik,* v. 23, Apr. 1957, p. 97-104.

A study of the mechanism of rust formation and metallic corrosion caused by hygroscopic pulverized salts affected by air dampness.

11866* (Finnish.) Corrosion at Bimetallic Contacts. **Korroosio Kahden metallin liitoskohdassa.** Tenho Sneck. *Teknillisen Kemian Aikakauslehti,* v. 14, Mar. 30, 1957, p. 137-144.

A review of recent investigations.

11867 The Anodic Oxidation of Some Dilute Binary Zirconium Alloys. George B. Adams, Jr., Curtis E. Borchers, and Pierre Van Rysselberghe. *University of Oregon (U. S. Atomic Energy Commission),* AECU-3388, Jan. 1957, 26 p. (UF767 U3au Contin.)

Changes in electrolytic parameters for the anodic oxidation process are correlated with changes in alloying constituents for a series of dilute binary Zr alloys.

11868 Sodium Corrosion and Oxidation Resistance of High-Temperature Brazing Alloys. G. M. Slaughter, C. F. Leitten, Jr., P. Patriarca, E. E. Hoffman, and W. D. Manly. *Welding Journal,* v. 36, May 1957, p. 217s-225s.

Numerous alloys were evaluated. Alloy systems of the Ni-Si-B, Ni-Cr-Si-B, and Ni-Cr-Si types showed excellent resistance to Na corrosion and oxidation.

11869* (German.) Investigations on the Current Density Distribution of Cathodic Protection in Different Soils. **Über die Stromverteilung von kathodisch geschützten analgen in verschiedenen Bodenarten.** M. Solti. *Werkstoffe und Korrosion,* v. 8, May 1957, p. 256-260.

Points out how the most favorable conditions of the homogeneous current density distribution in soils will be achieved.

11870* (German.) Tensile Corrosion and the Theory of Tenacity. **Spannungskorrosion und Festigkeitstheorie.** K. Matthaes. *Werkstoffe und Korrosion,* v. 8, May 1957, p. 261-277.

Analysis of the causes of tensile corrosion cracks.

11871* (German.) The Influence of Light Upon the Corrosion of Iron in Aqueous Solutions. **Einfluss des Lichtes auf die Korrosion des Eisens in Lösungen.** B. Lovreček and E. Korkut. *Werkstoffe und Korrosion,* v. 8, May 1957, p. 277-280.

The corrosion rate of steel specimens exposed to light is about 20% higher than that of unexposed ones.

11872 The Corrosion Properties of Zirconium-Base Fuel Alloys. S. Kass. *Westinghouse Electric Corporation, Atomic Power Division (U. S. Atomic Energy Commission)*, WAPD-136, Nov. 1955, 41 p. (UF767 Un3.1wa Contin.)

Corrosion of low U-Zr base alloys is characterized by the initial formation of a protective oxide film, followed by a breakdown of the protective film and general spalling. Corrosion resistance decreases with increasing U content. The Zr-4 w/o U-8 w/o Nb alloy shows excellent promise as a corrosion resistant fuel alloy.

11873 External Casing Corrosion—Where Is It? How Bad Is It? J. D. Sudbury. *World Oil*, v. 144, May 1957, p. 210 + 5 pages.

Casing potential surveys proved very effective in predicting conditions of pipe. Cathodic protection can be successfully used to prevent external casing corrosion.

11874* (Russian.) Iron Corrosion in Hydrochloric Acid in the Presence of Inhibitors at Different Temperatures. **O korrozii zheleza v solianoi kislote v prisutstvii ingibitorov pri raznykh temperaturakh.** I. P. Anoshchenko. *Zhurnal Prikladnoi Khimii*, v. 30, Mar. 1957, p. 393-400.

A study by means of polarization diagrams, of the effect of KBr, urotropine, acridine, and their combinations on the corrosion of iron in a solution of HCl at 20, 40, 60, and 80 C.

See also: **11123** (corrosion in petroleum refineries); **11397** (dissolution of Th).

METALS—EXTRACTION AND REFINING

11875 Importance of Gas Solid Contact in the Production of Pig Iron. II. T. L. Joseph. *Blast Furnace and Steel Plant*, v. 45, May 1957, p. 489-493.

The possibilities of better control, increased efficiency, lower coke rates, and higher tonnages through the use of beneficiated raw materials deserve careful study in formulating plans for expansion and development.

11876 Desulphurization of Pig Iron With Solid Lime. Bo Kalling and Sven Eketorp. *Blast Furnace and Steel Plant*, v. 45, May 1957, p. 494 + 4 pages.

A rotating furnace is used for efficient contact.

11877 Blast Furnace Automatic Charging Control Integrated. *Blast Furnace and Steel Plant*, v. 45, May 1957, p. 498-500.

Instruments and operating procedures for panel-board charging control system.

11878 Use of Radioactive Calcium for Studying the Contamination of Steel by Refractory Particles During Pouring. O. M. Margulis and A. G. Karaulov. *Henry Brutcher Translation No.* 3849, 11 p. (Abridged from *Ogneupory*, v. 21, no. 6, 1956, p. 253-258.) Henry Brutcher, Altadena, Calif.

Performance of fired fireclay, kaolin, high-alumina, and fireclay + graphite compositions are evaluated.

11879 Deoxidation of Steel. Chapters individually paged. 1957. American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc., New York. (TN731 Am35.5d)

A memorial volume to C. H. Herty, Jr., prepared by the National Open Hearth Steel Committee. Chapters by various authors cover openhearth process, solubility of Fe oxides in Fe, and deoxidation procedures using Si, Al, and Mn-Si alloys.

11880 Progress in the Continuous Casting of Tin Bronzes. E. C. Ellwood. *Foundry Trade Journal*, v. 102, May 23, 1957, p. 627-633.

History and development of the process of vertical continuous casting.

11881* (Czech.) Effect of Manganese on the Oxidation of Metal and the Speed of the Desulfurization Process in a Basic Open-Hearth Furnace. **Vliv manganu na oxydaci kovu a rychlost odsiřovacího pochodu v zásadité peci SM.** Vilém Friedrich. *Hutnické Listy*, v. 12, Apr. 1957, p. 324-329.

11882 Stainless Steel Melting Practice. II. *Industrial Heating*, v. 24, May 1957, p. 950 + 3 pages.

A review of papers concerning melting practice during the reducing, slagging, and tapping periods.

11883 Carbon Equivalent Concept. K. G. Lewis and J. McCracken. *Iron & Steel*, v. 30, May 1957, p. 165-169; June 1957, p. 207-213.

Determination of carbon equivalent values and metallurgical load. Application to controlled charging in the basic open-hearth manufacture of quality forging steels.

11884* (Russian.) Solubility of Oxygen in Melts of Iron and Manganese. **Rastvorimost' kisloroda v rasplavakh zheleza s margantsem.** B. V. Linchevskii and A. M. Samarin. *Izvestiia Akademii Nauk SSSR, Otdelenie Teknicheskikh Nauk*, no. 2, Feb. 1957, p. 9-18.

Determination of solubility of Mn in liquid Fe. Mechanism of Mn oxidation. Oxygen activity in Fe-Mn melts.

11885 Thermodynamic Properties of CS and Solutions of Sulfur in Carbon-Saturated Liquid Iron. C. J. B. Fincham and R. A. Bergman. *Journal of Metals*, v. 9; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, May 1957, p. 690-694.

A study of the equilibria, at 1600 and 1800 C, between dilute solutions of S in carbon-saturated liquid iron and gas mixtures consisting, initially, of A and CS_2.

11886 Effect of Oxygen Input Rates in the Decarburization of Chromium Steel. G. W. Healy and D. C. Hilty. *Journal of Metals*, v. 9; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, May 1957, p. 695-707.

Methods for calculating the heat balance of a furnace during the O blow and for estimating the concurrent change in Cr analysis. These relationships are used to evaluate the effects of O input rate, Cr content, and temperature of the bath before the blow on metallic oxidation, O usage, and temperature at the end of the blow.

11887* Optimum Operating Procedure for Basic Electric Steel Furnace for Desulfurization and Dephosphorization. John Zotos. *Journal of Steel Castings Research*, no. 8, May 1957, p. 12-16.

11888 Explosions of Molten Aluminum in Water—Cause and Prevention. George Long. *Metal Progress*, v. 71, May 1957, p. 107-112.

Violent explosions, which occur sometimes in ingot casting if a thin layer of water is trapped under a sudden rush of molten metal, can be avoided by greasing or painting the bottom of the water container.

11889 Solid and Liquid Drossing of Thorium Containing Tracer Level Fission Products. N. D. Potter. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-1734, Apr. 1957, 16 p. (UF767 Un3.1na Contin.)

Thorium was drossed at 1700 and 1100 C, using solid oxides, carbides, nitrides, sulfides, and a liquid mixture of oxide-fluoride. Best decontamination was achieved with the latter two materials.

11890 Fission Product Separation From Thorium-Uranium Alloy by Arc-Zone Melting. R. D. Burch and C. T. Young. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-1735, Apr. 1957, 23 p. (UF767 Un3.1na Contin.)

Radiochemical analyses of the processed alloys indicated that U, Te, Zr, and Ru were successfully moved in the direction of zone travel, and that some of the fission products were removed by volatilization.

11891 (German.) Lances With Explosive Charge (Jet Tappers) for Opening the Tapholes of Open-Hearth Furnaces. **Abstichladungen zum Aufschiessen von Siemens-Martin-Öfen. I.** Design and Mode of Action of the Shooting Lance. **Aufbau und Wirkungsweise der Abstichladung.** Josef Prior. **II.** Opening the Tapholes of Open-Hearth Furnaces by Means of Lances With Explosive Charge (Jet Tappers). **Aufschiessen der Abstiche mit Sprenglanzen.** Werner Burmeister. *Stahl und Eisen*, v. 77, May 2, 1957, p. 562-567.

11892* (Russian.) Lined Metal Hot-Tops. **Metallicheskie futerovannye pribyl'nye nadstavki.** I. S. Tkachev. *Stal'*, v. 17, Apr. 1957, p. 318-319.

The replacement of ceramic floating hot-tops by lined steel ones, when pouring killed steel, resulted in longer service life and reduced metal losses

See also: **11064** (blast furnace lining); **11078** (chromite and SiO_2 refractories in steelmaking); **11690** (oil burner for open hearth); **11691** (open-hearth fuel gas control); **11935** (activity of Zn in molten Cu-Zn alloys); **12229** (separation of Pu from U); **12346** (cleaning of blast-furnace gas); **12353** (cleaning of smelter gases).

METALS—FINISHING, POLISHING, AND CLEANING

11893* Low Temperature Descaling Safeguards Titanium Properties. Irwin Stambler. *Aviation Age*, v. 27, May 1957, p. 130-133.

Advantages of a new "Turco" process.

11894 Ultrasonic Cleaning With Magnetostrictive Vibrators. H. J. Gollmick and K. Tesser. *Henry Brutcher Translation No.* 3828, 11 p. (From *Metalloberfläche*, v. 10, no. 8, 1956, p. 233-237.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 14706, v. 5, Nov. 1956.

11895* Shotblasting Developments in Metal Surface Preparation. J. Carle. *Corrosion Prevention and Control*, v. 4, May 1957, p. 49-55.

Applications of shot blasting for descaling sheet and strip, cleaning castings, etc. Shot peening application.

11896 Basic Data on Mechanical Cleaning Operations in Steel Plants. Gilbert D. Dill. *Iron and Steel Engineer*, v. 34, May 1957, p. 123-131.

Eight major applications of wheel blasting are now in operation in various steel plants. Results are increased production, reduced costs, and improved product.

11897 Barrel Finishing—How and When to Use It. Lester F. Spencer. *Metal Finishing*, v. 55, May 1957, p. 48-54.

Variables to be considered; equipment.

11898* How to Clean and Etch Aluminum. D. Gardner Foulke and O. Kendle Irgens. *Modern Metals*, v. 13, May 1957, p. 44 + 2 pages.

Solvent degreasing; emulsion cleaners; deoxidizers; alkaline cleaners; acid, alkali etchants; sludge prevention; typical cycles; conversion coatings.

11899 Effect of Media Size and Time Cycle on Barrel Finishing Results. C. J. Glasrud and F. E. Smith. *Products Finishing*, v. 21, May 1957, p. 40 + 4 pages.

11900* (Polish.) Problems in the Operation of Centrifugal Cleaning Barrels. **Z zagadnień eksploatacji oczyszczarek wirnikowych.** Franciszek Tomczykiewicz. *Przeglad Odlewnictwa*, v. 7, Apr. 1957, p. 102-105.

Kinds of abrasive materials. Factors influencing the rate and quality of cleaning operations.

11901 (German.) Design and Performance of Hydraulic Descaling Plants in Rolling Mills. **Ausführung und Leistung Hydraulischer Entzunderungsanlagen in Walzwerken.** Wolfgang Berns. *Stahl und Eisen*, v. 77, May 2, 1957, p. 567-576.

11902* (German.) Theory and Engineering of Flame Cleaning. **Theorie und Praxis des Flammstrahlens.** Karl W. Sippell. *Werkstoffe und Korrosion*, v. 8, Apr. 1957, p. 185-216.

Influence of flame temperature on properties of structural steels. Influence of several fuel gases on effectiveness of the method.

METALS—FOUNDRY PRACTICE

11903* (Russian.) Mechanism of Formation of Nodular Graphite in Cast Irons. **O mekhanizme obrazovaniia sharovidnogo grafita v chugunakh.** I. E. Bolotov, V. I. Syreishchikova, and S. G. Guterman. *Fizika Metallov i Metallovedenie*, v. 4, no. 1, 1957, p. 177-180.

Formation of nodular graphite when treating cast iron with a modifier. Elimination of S and O from the melt.

11904* (Italian.) Improving Cast Iron With Gas Injection. **Miglioramento della ghisa mediante iniezione di gas.** *Fonderia*, v. 6, Apr. 1957, p. 149-153.

Effects of A, H, air, N, or O on properties of cast iron.

11905* (Italian.) Calcium Silicide in the Ferrous Metal Foundry. **Il siliciuro di calcio nella fonderia di metalli ferrosi.** *Fonderia*, v. 6, Apr. 1957, p. 155-157.

A study of CaSi as a deoxidizer, graphitizer, and desulfurizer. Effects on gray cast iron and steel.

11906* (French.) Gravity Chill Casting. Fundamentals—Applications to Light Alloys. **Le moulage en coquille par gravite. Généralités—Applications aux alliages légers.** Maurice Billing. *Fonderie*, no. 135, Apr. 1957, p. 161-169.

Advantage of chill-molds for light alloys.

11907 The Carbon Dioxide Process. Walter E. Gruver, Jr. *Foundry*, v. 85, June 1957, p. 106-110.

Chemistry and mechanization of reaction of the CO_2 molding process.

11908 Swedish Foundry Prepares Sand Automatically. C. G. Soderlund. *Foundry*, v. 85, June 1957, p. 118-121.

Moisture content of sand is adjusted on basis of dielectric properties of sand measured between condenser plates.

11909 Control of Aluminium-Alloy Melting Practice. *Foundry Trade Journal*, v. 102, Apr. 25, 1957, p. 509-511.

Melting factors affecting properties of the finished casting, with special attention to alloys LM6 and LM10.

11910* (German.) The Effect of Gas Scavenging on Magnesium Consumption in the Production of Spheroidal Graphite Cast-Iron. **Wirkung einer Gasspülung auf den Magnesiumverbrauch bei der Herstellung von Gusseisen mit Kugelgraphit.** Wilhelm Patterson. *Giesserei*, v. 44, Apr. 25, 1957, p. 216-227.

Mechanism of the scavenging effect. Theory of crystallization of spheroidal graphite.

11911* (German.) Investigations on the Refractory Lining, the Blowing Practice and the Size of Hot Blast Cupolas Used in Steel Plants. **Untersuchungen über die feuerfeste Zustellung, Windführung und Grosse von Stahlwerks-Heisswindkupolöfen.** Wilhelm Patterson and Albert F. Oberhofer. *Giesserei*, v. 44, Apr. 25, 1957, p. 227-237.

11912* (German.) A Contribution to the Theory of the Water-Glass Molding Technique. **Beitrag zur Theorie des Wasserglas-Formverfahrens.** Siegfried Böhmer. *Giessereitechnik*, v. 3, Feb. 1957, p. 26-32.

Fundamental principles of colloid chemistry. Composition and properties of sodium silicate solutions. Importance of the solution composition; various drying processes. Hardening with carbon dioxide. Effect of impurities.

11913* (German.) Perfect Molds and Castings. **Fehlerfreie Form-Fehlerfreies Gussstück.** Heinrich Poetter. *Giessereitechnik*, v. 3, Feb. 1957, p. 43-46.

Advice for the molder on causes of defective castings and their prevention.

11914 Liquid Shrinkage. E. Longden. *Iron & Steel*, v. 30, May 1957, p. 173-178.

Problems of compensation in steel castings. Recommended gating and feeding methods. (To be concluded.)

11915* (Russian.) Effect of Superheat Temperature and Magnesium Introduction on Properties of Cast Iron With Nodular Graphite. **Vliianie temperatury peregreva i vvoda magniia na svoistva chuguna s sharovidnym grafitom.** E. E. Farafonov and M. S. Kolmakova. *Liteinoe Proizvodstvo*, no. 3, Mar. 1957, p. 14-16.

Investigation of the relation between the amount of added Mg, the temperature of the ladle, and smelting variables.

11916* (Russian.) Casting Acid-Resistant and Heat-Resistant Chromium Alloys. **Otlivki iz kislotoupornykh i zharostoikikh khromistykh splavov.** K. I. Vashchenko and L. I. Rostovsev. *Liteinoe Proizvodstvo*, no. 4, Apr. 1957, p. 7-10.

Composition, properties, and fabrication of a C-Cr-Mn-Si steel for use in critical service, requiring a high degree of corrosion and heat resistance.

11917 The Relation of Runner Layout to Ease of Trimming. H. K. Barton and L. C. Barton. *Machinery (London)*, v. 90, Apr. 26, 1957, p. 945-955.

Factors affecting gate removal; use of ring-gates; runner design; use of slotted bars and bench blocks, for gate breaking; castings trimmed from the spray; use of bifurcated sprues; direct feeding from sprue to cavity.

11918* Guide to Engineered Castings. *Modern Castings*, v. 31, June 1957, p. 55-70.

Structural design recommendations; mechanical properties of alloys; meeting special service conditions; cast metals and their typical uses; molding and casting processes.

11919* (Polish.) The Effect of Inoculation With Ferro-Silicon on the Quantity and Size of Graphite Spheroids in Spheroidal Cast Iron. **Wpływ modyfikowania zelazokrzemem na ilosc i wielkosc sferoidów grafitowych w żeliwie sferoidalnym.** Jerzy Piaskowski. *Prace Instytutu Odlewnictwa*, v. 5, no. 1, 1956, p. 4-14.

By increasing the addition of ferrosilicon and especially by introducing it in several portions it is possible to increase the quantity of graphite spheroids in cast iron.

11920 Proceedings of the Institute of British Foundrymen. D. Pratt, editor. v. XLIX. 354 p. 1956. Institute of British Foundrymen, Manchester, England. (TS200 In7p Vis.)

A compilation of papers dealing with shell molding, cupola operation, properties of castings, foundry tests, shrinkage defects, the CO_2 process, dust and fume extraction, and related subjects.

11921 (German.) The Hot-Blast Cupola in the Open-Hearth Steel Plant. **Der Heisswind-Kupolofen im Siemens-Martin-Betrieb.** Albert-Friedrich Oberhofer. *Stahl und Eisen*, v. 77, May 16, 1957, p. 643-651.

Importance of cupola furnaces. Steel scrap and direct processed blooms as charging materials. Trials with raw ore. Desulfurization of iron as dependent on operating conditions. Behavior of iron oxides. Variables affecting recarburization.

See also: **11160** (analysis of cupola slag); **11880** (continuous casting of Sn-bronze); **11882** (melting of stainless steel); **12035** (effect of overheating on structure of cast iron); **12087** (quality control of pressure die-castings).

METALS—HEAT TREATMENT

11922 Effects of Acoustical Waves on the Annealing of Steels. H. V. Fairbanks and F. J. Dewez, Jr. *Acoustical Society of America, Journal*, v. 29, May 1957, p. 588-592.

Ultrasonic treated 0.07% C hypoeutectoid steel samples were finer in grain size and harder than the untreated hypo-eutectoid steel samples. Increasing frequency or intensity of the applied ultrasonic energy brought about a corresponding decrease in grain size and an increase in hardness.

11923* Control of Carbon Potential in Furnace Atmospheres. Robert S. Burpo, Jr. *American Society of Naval Engineers, Journal*, v. 69, May 1957, p. 295-303.

The C potential of a complex gas atmosphere (based on an endothermic carrier gas of constant percentages of CO and H_2) can be controlled by using its dew point as the control mechanism.

11924* (Czech.) The Dependence of Nitrogen Content on the Amount of Carbon in Carbo-Nitrided Cases. **Závislost obsahu dusíku na obsahu uhlíku v nitrocementovaných vrstvách.** Bohumil Přenosil. *Hutnické Listy*, v. 12, Mar. 1957, p. 222-227.

Nitrogen decreases with increasing carbon content, this relation being more pronounced at 860 than at 900 C.

11925* (Czech.) The Influence of Nitrogen on the Hardenability of Carbo-Nitrided Cases and on the Isothermal Transformation of Austenite. **Vliv dušíku na prokalitelnost nitrocementovaných vrstev a isothermickou přeměnu austenitu.** Bohumil Přenosil. *Hutnické Listy*, v. 12, Apr. 1957, p. 289-299.

11926 Study of Factors Influencing Surface Staining of Cold Rolled Steel. I. Types of Defects and Their Occurrence. C. R. Lillie and D. W. Levinson. **II. Reaction Mechanism of Black Stain Formation on Annealed Steel Coils.** F. V. Schossberger, K. Hattori, and H. Marver. *Iron and Steel Engineer*, v. 34, May 1957, p. 69-81.

Keeping the CO/CO_2 low in the annealing cycle will eliminate "snaky edge" defects in a number of cases. Sluggish gas flow also contributes to undesirable reactions during heating.

11927 Hardenability Test for Deep Hardening Steels. Carl M. Carman, Dominick F. Armiento, and Harold Markus. *Metal Progress*, v. 71, May 1957, p. 77-80.

A modified Jominy test for more realistic deep hardening characteristics.

11928* (Polish.) The Effect of Boron on the Annealing Process and the Properties of Black Heart Malleable Cast Iron. Jan. Raczka. *Prace Instytutu Odlewnictwa*, v. 5, no. 1, 1956, p. 22-29.

Additions of boron as ferroboron (up to 0.012%) as well as dehydrated borax (up to 0.015%) do not change the speed of free cementite decomposition, but they accelerate the decomposition of eutectic cementite to a high degree. Such quantities of boron do not change the mechanical properties.

11929* (Polish.) Heat Treatment of Spheroidal Cast Iron. **Obróbka cieplna żeliwa sferoidalnego.** Janusz Rutkowski and Halina Sidor. *Prace Instytutu Odlewnictwa*, v. 5, no. 2/55, 1956, p. 52-65.

Determination of mechanical properties and structure of three kinds of cast iron subjected to austempering, heat refinement, and normalizing with tempering.

11930* (Polish.) Influence of Inoculation With Ferrosilicon on Annealing and on the Properties of Black Heart Malleable Cast Iron. **Wpływ modyfikowania zelazokrzemem na wyzarzanie i własnoŝci czarnego żeliwa ciagliwego.** Jan Raczka. *Prace Instytutu Odlewnictwa*, v. 5, no. 3/55, 1956, p. 83-88.

Inoculation of cast iron with a low Si content (about 0.5%) resulted in a shortening of annealing time, little tendency to primary graphite formation, and no change in mechanical properties.

11931* (Polish.) Annealing Malleable Cast Iron in Liquid Media. **Wyżarzanie żeliwa ciagliwego w ośrodkach ciekłych.** Jerzy Jackowski and Wacław Sakwa. *Przeglad Odlewnictwa*, v. 7, Apr. 1957, p. 93-96.

Annealing in $BaCl_2$ and NaCl media. Pearlitic malleable cast iron after 11 hrs. annealing had tensile strength above 40 kg. per $mm.^2$ and elongation above 5%. Ferritic malleable cast iron after 16 hrs. annealing showed tensile strength above 30 kg. per $mm.^2$ and elongation above 11%.

11932 Choosing the Right Quench. O. E. Cullen. *Steel*, v. 140, May 13, 1957, p. 123-126.

Quenching treatments, media, and temperatures. Distortion and growth of heat treated parts.

11933 Tool Steels. I. Basic Concepts Governing Their Treatment. L. F. Spencer. *Steel Processing and Conversion*, v. 43, May 1957, p. 253 + 7 pages.

Hardenability; ordinary and special heat-treatment procedures.

11934 Controlled Atmospheres. A Survey of Their Types and Fields of Application in Metal Processing Operations. II. C. E. Peck. *Steel Processing and Conversion*, v. 43, May 1957, p. 277-281.

Controlled atmospheres for brazing, sintering, and bright annealing.

See also: **11754** (furnace atmosphere analyzer); **11801** (design of stainless steel castings); **11831** (heat treatment of gear steels); **11944** (normalizing nodular iron); **11966** (hardenability of steel castings); **11972** (heat treatment of stainless steel); **11985**

(heat treatment of Si steel); **12027** (stress-relief treatment of Al); **12030** (heat treatment of steel); **12053** (heat treatment of white cast iron); **12428** (stress relief of steel welds).

METALS—MECHANICAL AND PHYSICAL PROPERTIES

11935 (English.) **The Activity of Zinc in Liquid Copper-Zinc Alloys.** L. H. Everett, P. W. M. Jacobs, and J. A. Kitchener. *Acta Metallurgica*, v. 5, May 1957, p. 281-284.

An entrainment method was used for the determination of the vapor pressure of Zn over the pure metal and over liquid Cu-Zn alloys.

11936* **Non-Linear Elasticity in Aluminium Alloys.** A. B. Watts. *Aeronautical Quarterly*, v. 8, May 1957, p. 103-122.

Tests on round bar specimens of various strong alloys (unclad) in the fully heat-treated condition in both tensile and compressive loading establish that there is a progressive change in the tangent elastic modulus with stress.

11937* (German.) Effect of a Final Annealing in High Vacuum on the Magnetic Reversal Losses of Hot and Cold Rolled Transformer Sheets. **Einfluss einer Schlussglühung im Hochvakuum auf die Ummagnetisierungsverluste warm und kalt gewalzter Transformatorenbleche.** Franz Lihl. *Archiv für das Eisenhüttenwesen*, v. 28, Apr. 1957, p. 223-228.

Metallographic, magnetic, and X-ray examination of hot and cold-rolled transformer sheets with 4.3% Si and 0.25% Al after annealing in high vacuum. Decrease of the magnetic reversal losses in comparison with annealing in protective gases.

11938* (English.) **On the Entropy of Solid and Liquid Metals.** G. Borelius. *Arkiv för Fysik*, v. 11, no. 5, 1957, p. 421-427.

Shows that there is no real experimental support for some assumptions considering the value C_v.

11939 Effect of Cold Work on Elevated-Temperature Properties of Types 301, 305, and 310 Stainless Steels. R. A. Lula, A. J. Lena, and H. M. Johnson. *ASME, Transactions*, v. 79, May 1957, p. 921-926.

Elevated-temperature strength can be improved by cold-working, provided extensive recrystallization during exposure does not take place. Rupture strength of cold-rolled materials decreases progressively with increasing recrystallization.

11940 Combination Creep-Rupture Test Specimen. M. J. Manjoine. *ASTM Bulletin*, no. 222, May 1957, p. TP104-TP105.

A specimen which combines a smooth and a notched test section has proved worth-while in creep-rupture acceptance testing and in the development of new alloys and heat treatments.

11941* **Bibliography on Hardness & Hardness Testing From 1937 to 1955.** 118 p. 1956. Industrial Diamond Information Bureau, London. (ZTA407 In2b Ref.)

11942 True Stress-Strain Properties of Natural Uranium. M. T. McGowan and R. M. Treco. *Bridgeport Brass Company, Bridgeport, Connecticut (U. S. Atomic Energy Commission)*, BRB-34, Nov. 1956, 28 p. (UF767 Un3.1br Contin.)

11943* **Factors Affecting the Mechanical Properties of Pearlitic Nodular Irons.** G. N. J. Gilbert. *British Cast Iron Research Association, Journal of Research and Development*, v. 6, Feb. 1957, p. 484-497 + 2 plates.

11944* **Tensile and Fatigue Tests on Normalized Pearlitic Nodular Irons.** G. N. J. Gilbert and K. B. Palmer. *British Cast Iron Research Association, Journal of Research and Development*, v. 6, Feb. 1957, p. 498-504 + 4 plates.

Normalizing is shown to improve proof stress, tensile strength, hardness, and elongation.

11945* **Factors Relating to the Stress/Strain Properties of Cast Iron.** G. N. J. Gilbert. *British Cast Iron Research Association, Journal of Research and Development*, v. 6, Apr. 1957, p. 546-587 + 6 plates.

Stress-strain properties and mechanism of failure are described by considering the material as steel plus graphite. Deformation is shown to be partly elastic and partly plastic.

11946 Strain Hardening and Residual Stresses in the Boring of Structural Steels. P. E. D'yachenko and N. A. Podosenova. *Henry Brutcher Translation No.* 3753, 6 p. (Abridged from *Vestnik Mashinostroeniya*, v. 34, no. 7, 1954, p. 45-47.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 16298, v. 3, Nov. 1954.

11947 Low Temperature Resistivity of the Transition Elements: Cobalt, Tungsten, and Rhenium. G. K. White and S. B. Woods. *Canadian Journal of Physics*, v. 35, May 1957, p. 656-665.

11948 Defect Structure and the Temperature Dependence of Hardness of an Intermetallic Compound. J. H. Westbrook. *Electrochemical Society, Journal*, v. 104, June 1957, p. 369-373.

Hardness-temperature studies of six alloys in the compound AgMg or β-phase show that lattice defects are a strengthening factor at low homologous temperatures and a weakening factor at high homologous temperatures.

11949* (Russian.) The Temperature Course of Spontaneous Magnetization of Alloys in the Region of the Curie Point. **O temperaturnom khode samoproizvol'noi namagnichennosti v splavakh v oblasti tochki Kiuri.** K. Belov and Ia. Paches. *Fizika Metallov i Metallovedenie*, v. 4, no. 1, 1957, p. 48-53.

The temperature curves of self magnetization in the region of the Curie point were determined for Ni and some Ni alloys by three different methods. It was found that the so-called "tails" on the curves near the Curie point are larger for alloys than for metals. Their appearance and length are related to the heat treatment and concentration of the alloying element.

11950* (Russian.) Magnetic Properties of the Ordered Fe_3Al Alloy. **O magnitnykh svoistvakh uporiadochivaiushchegosia splava Fe_3Al.** V. I. Ianovskii. *Fizika Metallov i Metallovedenie*, v. 4, no. 1, 1957, p. 70-75.

Effect of temperature on the magnetic properties of Fe_3Al alloy (25 at. % Al). The order-disorder transformation point is around 550 C.

11951* (Russian.) Mechanism of Plastic Deformation and Mechanical Properties of Al. **Mekhanizm plasticheskoi deformatsii i mekhanicheskie svoistva aliuminiia. I.** Study of the Mechanism of Plastic Deformation of Al According to the Traces Arising on Its Surface During Elongation. **Izuchenie mekhanizma plasticheskoi deformatsii aliuminiia po sledam, voznikaiushchim na ego poverkhnosti pri rastiazhenii. II.** Formation of Blocks in Al Grains During Plastic Deformation. **Blokoobrazovanie v lernakh aliuminiia pri plasticheskoi deformatsii.** E. S. Iakovleva. *Fizika Metallov i Metallovedenie*, v. 4, no. 1, 1957, p. 141-150 + 2 plates.

11952* (French.) Effect of the Structure of Standard Castings on Their Elastic Behavior. **Influence de la structure des fontes courantes sur leur comportement élastique.** Paul Le Rolland and Elisabeth Plénard. *Fonderie*, no. 134, Mar. 1957, p. 105-112.

Effect of structure on the modulus of elasticity of lamellar graphite castings. The graphitic structure is a determining factor in the elastic behavior which is a function of the graphite content and the cooling rate.

11953 The Effect of Uranium Hydride Distribution and Recrystallization on the Tensile Properties of Uranium. H. R. Gardner and J. W. Riches. *Hanford Atomic Products Operation (U. S. Atomic Energy Commission)*, HW-43543, Jan. 1957, 34 p. (UF767 Un3.1hw Contin.)

Effects of H concentration, β uranium hydride formation and particle size, recrystallization, and cooling rate from recrystallization temperature, on the tensile properties of U over a temperature range of −20 to 200 C.

11954* (Czech.) Temperature Control in Long-Time Creep Tests. **K regulaci teploty při dlouhodobých zkouškách tečení.** Bohdan Šesták. *Hutnické Listy*, v. 12, Mar. 1957, p. 202-206.

The principal types of temperature regulators are evaluated with regard to the severe requirements involved in creep tests.

11955 The Effect of Neutron Irradiation on the Mechanical Properties of Titanium and Zirconium. M. J. Makin and F. J. Minter. *Institute of Metals, Journal,* v. 85, May 1957, p. 397-402.

The changes in mechanical properties of Ti and Zr after irradiation with 5 X 10^{19} neutrons/cm.^{2} were studied at a variety of temperatures.

11956 A Note on the Brittle Intergranular Fracture of Beta-Brass. S. Harper. *Institute of Metals, Journal,* v. 85, May 1957, p. 415-416 + 1 plate.

Stress concentrations at grain boundaries, in conjunction with a rapid rate of straining, are shown to be essential factors in causing intercrystalline failure at high temperatures in ordered β-brass.

11957 The Behavior of Fractured Copper Fatigue Specimens on Annealing. D. S. Kemsley. *Institute of Metals, Journal,* v. 85, May 1957, p. 417-420 + 2 plates.

11958 Ferrite Networks. Some Effects in Plain Carbon Steel. K. J. Irvine and F. B. Pickering. *Iron & Steel,* v. 30, June 1957, p. 219-223.

Detrimental effects of ferrite networks in hardened and tempered steels. Causes of cracking in medium carbon steel ingots and wrought products.

11959 Microhardness Penetration Curves in Two Nickel-Bearing Carburized Steels. Henry M. Otte. *Iron and Steel Institute, Journal,* v. 186, May 1957, p. 13-21.

Hardness through the case of two carburized steels was measured after air cooling or water quenching small sections, and was related to the amount of retained austenite and the carbon content.

11960 Effect of Alloying Elements on the High-Temperature Tensile Strength of Normalized Low-Carbon Steel. J. Glen. *Iron and Steel Institute, Journal,* v. 186, pt. 1, May 1957, p. 21-48.

For a simple Fe-C alloy one strain-age-hardening effect was obtained with a maximum at about 200 C. With a little N present this effect was intensified. With the addition of either Mn, Cr, Mo, W, or Cu an additional strain-age-hardening effect was obtained at a temperature higher than 200 C, the actual temperature depending on the element used.

11961 Electrical Resistivity of Nickel-Palladium Alloys. A. W. Overhauser and A. I. Schindler. *Journal of Applied Physics,* v. 28, May 1957, p. 544-546.

11962 Magnetic Domain Patterns on Thin Films. H. J. Williams and R. C. Sherwood. *Journal of Applied Physics,* v. 28, May 1957, p. 548-555.

Patterns were observed on evaporated films of Fe, Co, Ni, and several different alloys of these elements. The direction of easy magnetization, in films of all compositions could be changed by re-heat-treating them in a magnetic field with a new orientation. Patterns were obtained on films ranging in thickness from approximately 50 to 1200 A.

11963 Dissociation Energies of Cu_2, Ag_2, and Au_2. Paul Schissel. *Journal of Chemical Physics,* v. 26, May 1957, p. 1276-1280.

11964* Magnetic Properties of Pure and n-Type Germanium at Liquid Helium Temperatures. F. T. Hedgcock. *Journal of Electronics,* v. 2, ser. 1, May 1957, p. 513-528.

Magnetic susceptibility was measured between 4.2 K and room temperature. An anomalous low temperature paramagnetism was observed in high purity Ge.

11965 Low Temperature Heat Capacities and Related Properties of Potassium and Na_2K. C. A. Krier, R. S. Craig, and W. E. Wallace. *Journal of Physical Chemistry,* v. 61, May 1957, p. 522-529.

11966* Low Temperature Properties of Low and Medium Alloy Steel Castings. G. M. Michie and W. J. Jackson. *Journal of Steel Castings Research,* no. 8, May 1957, p. 8-11.

The influence of composition on hardenability is stressed. Includes data on the effects of quenching, normalizing, and tempering treatments.

11967* How to Test Tool Steels. H. D. Weckener. *Mechanical World and Engineering Record,* v. 137, May 1957, p. 198-201.

Metallographic, physical, and technological methods and results.

11968* (Dutch.) Meaning of the Tension Properties in Measuring Adhesive Power. **De betekenis van de spanningsgeometrie bij de meting van de hechting.** N. A. Brunt. *Metalen,* v. 15, Apr. 1957, p. 128-133.

Relationship between the physical concept of adherence and the phenomena covered by this term. The adhesive power, a function of time, is determined by distribution of microdefects causing the loosening process to begin. The loosening process starts as soon as deformation begins in the material.

11969* (German.) Time-Stress Investigation Using Multi-Sample Device at Temperatures Above 500 C. **Zeitstanduntersuchungen in Vielprobengerätenbei Temperaturen über 500°C.** H. Wiegand and H. Reiner. *Metall,* v. 11, May 1957, p. 357-361.

Report on 16 years investigation on long-time tensile testing of various metals at temperatures from 500 to 800 C.

11970* (Russian.) Mechanical Properties of Steels at High Temperatures and Various Deformations. **Mekhanicheskie svoistva stalei pri vysokikh temperaturakh i razlichnykh skhemakh deformirovaniia.** E. N. Moshnin and D. I. Berezhkovskii. *Metallovedenie i Obrabotka Metallov,* no. 4, Apr. 1957, p. 35-41.

The deformation resistance of low-alloy and constructional carbon steels at forging temperatures of 700 to 1200 C, remains unchanged during stretching, compressing and bending; during twisting, the stress tangents amount to 0.50-0.58 of the normal stresses.

11971* (Italian.) Influence of Work-Hardening and Annealing on Mechanical Properties of Al-Mg-Alloys. **Influenza dell'incrudimento e della ricottura sulle caratteristiche meccaniche delle leghe Al-Mg.** F. Gatto and L. Mori. *Metallurgia Italiana,* v. 49, Apr. 1957, p. 253-264.

Shows that the value of specific load at the moment of break is decreased by increasing Mg and reaches a maximum for a work-hardening of 15 to 20%.

11972 Cold Work Improves Age Hardening Stainless. John T. Richards and Ellsworth M. Smith. *Metal Progress,* v. 71, May 1957, p. 71-75.

Age hardenable stainless requires complex and precise heat treatments for optimum properties.

11973* The Electrical Properties of Thin Metal Films. Jacob Riseman. *New York Academy of Sciences, Transactions,* v. 19, Apr. 1957, p. 503-514.

Deals primarily with Cr films prepared by vacuum evaporation.

11974 Internal Friction and Shear Modulus of Thorium at High Temperatures. C. E. Dixon and H. Hori. *North American Aviation, Inc. (U. S. Atomic Energy Commission),* NAA-SR-1846, Apr. 1957, 12 p. (UF767 Un3.1na Contin.)

Internal friction and shear modulus measurements were made on iodide-processed thorium wire with a torsion pendulum, in vacuum, at temperatures between 20 and 800 C. In small-grained specimens a grain boundary internal friction peak was observed at about 530 C along with a corresponding relaxation of the shear modulus.

11975 Some Observations on the Nature of Fatigue Damage. P. J. E. Forsyth. *Philosophical Magazine,* v. 2, ser. 8, Apr. 1957, p. 437-440 + 2 plates.

Fatigue stresses produce damage in such materials as Al 7·5% Zn 2·5% Mg in the form of persistent bands which at an advanced stage contains rows of holes. The bands can be removed by heat treatment, but the holes are not healed. Slip band extrusion occurs along these damaged planes and the presence of the holes may on occasion cause very fine extrusions in the form of filaments.

11976 The Electronic Structure of Palladium-Uranium Alloys. J. A. Catterall. *Philosophical Magazine,* v. 2, ser. 8, Apr. 1957, p. 491-498.

The measured effects of U upon the paramagnetic susceptibility, electrical resistivity, thermoelectric power, and lattice parameter of Pd are considered.

11977 The Magnetic Properties of Alloys Having the Compositions of Mn_{60} Al_x Zn_{20-x} C_{20} and Mn_{60} Ga_x Zn_{20-x} C_{20}. L. Howe and H. P. Myers. *Philosophical Magaizne*, v. 2, ser. 8, Apr. 1957, p. 554-560.

11978 (English.) **Thermal and Electrical Conductivities of Tungsten. Experimental Results on Single Crystals Compared With Theory.** J. De Nobel. *Physica*, v. 23, Apr. 1957, p. 349-358.

11979 Thermal and Electrical Resistivity of Tellurium at Low Temperatures. Gaston Fischer, G. K. White, and S. B. Woods. *Physical Review*, v. 196, ser. 2, May 1, 1957, p. 480-483.

The maximum thermal conductivity in the case of a single crystal of 3-mm. diameter is about 10 watts per cm. deg. at 4 K.

11980 Superconducting Properties of Rhenium, Ruthenium, and Osmium. J. K. Hulm and B. B. Goodman. *Physical Review*, v. 106, ser. 2, May 15, 1957, p. 659-671.

Magnetic measurements; influence of various methods of specimen preparation and treatment. In particular the transition temperature of Re could be raised by about one degree above the ideal value, 1.699 K, by grinding or preparing the specimen as a powder.

11981 Magnetic Properties of Neodymium Single Crystals. D. R. Behrendt, S. Legvold, and F. H. Spedding. *Physical Review*, v. 106, ser. 2, May 15, 1957, p. 723-725.

At 20.4 K and above, the susceptibility obtained with the field perpendicular to the c_0 axis of the hexagonal crystal is greater than that obtained with the field parallel to the c_0 axis. In this same temperature range no anisotropy is observed in the basal plane. At 4.2 K antiferromagnetic ordering is indicated and magnetic anisotropy in the basal plane is observed.

11982* (English.) **Note on Some Properties of Gamma Brass.** Takao Sato and Seiichiro Noguchi. *Physical Society of Japan, Journal*, v. 12, Apr. 1957, p. 335-338.

In the relation between specific resistivity and concentration, a minimum occurs at about 34 wt. % Cu in the curve of resistivity vs. concentration. The value of the Hall coefficient and of the thermoelectric power are comparable to the values of pure metals. The magneto-resistance is small at room temperature but becomes large at liquid He temperature.

11983 The Atomic Heat of Cerium Between 1.5° and 20° K. D. H. Parkinson and L. M. Roberts. *Physical Society, Proceedings*, v. 70, no. 449B, May 1, 1957, p. 471-475.

Specific heat shows a marked maximum at 12·5 K, the magnitude of which increases with the number of times the specimen has been cooled.

11984 The Magnetic Susceptibility of Ytterbium From 1.3° K to 300° K. J. M. Lock. *Physical Society, Proceedings*, v. 70, no. 449B, May 1, 1957, p. 476-480.

11985* (Polish.) Effect of Primary Structure and Heat Treatment on Magnetic Properties of Silicon Steel of About 4% Si. **Wpływ struktury pierwotnej i obróbki cieplnej na własnośi magnetyczne stali o zawartości około 4% Si.** M. Markuszewicz. *Prace Instytutów Ministerstwa Hutnictwa*, no. 6, 1956, p. 281-308 + 11 plates.

Includes a critical survey of problems pertaining to the domain structure and the theory of coercive force. Concludes that no distinct association exists between the presence of secondary domain structure and magnetic properties.

11986* (Polish.) Coarse Crystalline Fracture of 18 HNWA Steel. **Przełom kamienisty stali 18 HNWA.** J. Ogerman. *Prace Instytutów Ministerstwa Hutnictwa*, no. 1, 1957, p. 41-56.

Established that coarse crystalline fractures, due to overheating, occur when the annealing temperature of steel exceeds 1250 C and are most manifest in specimens cooled from the above temperature at a medium rate.

11987 The Low-Temperature (2 to 4.2°K) Specific Heats of Palladium-Silver Alloys. F. E. Hoare and B. Yates. *Royal Society, Proceedings*, v. 240, ser. A, Apr. 24, 1957, p. 42-53.

11988 The Instability of Plastic Flow of Metals at Very Low Temperatures. Z. S. Basinski. *Royal Society, Proceedings*, v. 240, ser. A, May 21, 1957, p. 229-242.

Studies of unstable plastic deformation of Al alloys show that discontinuities in the stress-strain curve are caused by a localized temperature rise produced during the deformation.

11989 Creep and High Temperature Alloys. R. W. Guard. *Steel*, v. 140, May 27, 1957, p. 108 + 4 pages.

Current knowledge of creep behavior emphasizes the importance of balancing composition to obtain the right amount of dispersed phase in the grain boundaries, the right amount of dispersed or precipitated particles within the grains themselves, and the proper solid solution strengthening.

11990 (Czech.) Effect of Stress on Temper Brittleness. **Vliv napěti při namáhání žárupevných ocelí na jejich houževnatost.** J. Kermes. *Strojírenství*, v. 7, Apr. 1957, p. 296-298.

Research confirmed theory that stress has no effect upon temper brittleness.

11991* (English.) **The Brittle Fracture of Iron and Steel.** N. P. Allen. *Teknisk Ukeblad*, v. 104, May 9, 1957, p. 375-383.

Brittle and ductile modes of fracture; influence of composition and structure on transition temperature; testing for susceptibility to brittle fracture.

11992 A Phenomenological Relation Between Stress, Strain Rate, and Temperature for Metals at Elevated Temperatures. Elbridge Z. Stowell. *U. S. National Advisory Committee for Aeronautics, Technical Note* 4000, May 1957, 19 p. (TL570 Un3t)

Relation is suggested to account for the behavior of polycrystalline metals above the equicohesive temperature. Properties included are elasticity, linear thermal expansion, and viscosity.

11993 Aspects of Crack Sensitivity in Machinable Deposits on Cast Iron. R. D. Wasserman, J. F. Quaas, and J. P. Broderick. *Welding Journal*, v. 36, May 1957, p. 481-488.

Nickel-iron-alloy weld deposits on cast iron are less crack sensitive than the Ni and Ni-Cu types, irrespective of the grade of casting used.

11994 Notch-Toughness Characteristics of Submerged-Arc Weld Deposits. I. L. Stern, N. A. Kahn, and H. Nagler. *Welding Journal*, v. 36, May 1957, p. 226s-234s.

Notch-toughness characteristics of deposits used for a given steel can vary widely, but are reproducible for a given procedure and weld-deposit composition.

11995 Factors Affecting the Tensile Properties of Steel Weld Metal. C. M. Wayman and R. D. Stout. *Welding Journal*, v. 36, May 1957, p. 252s-262s.

Literature review emphasizes that, on the basis of its tensile properties, weld metal compares to cast steel in some respects and to wrought steel in others.

11996* (German.) Combined Tension and Torsion Deformation of Single-Crystal Copper Tubes. **Kombinierte Zug- und Torsionsverformung von Kupfer-Einkristallrohren.** Hans Rebstock. *Zeitschrift für Metallkunde*, v. 48, Apr. 1957, p. 206-219.

11997* (German.) Piezoelectrical Effect in Selenium. **Der piezoelektrische Effekt beim Selen.** H. Gobrecht, H. Hamisch, and A. Tausend. *Zeitschrift für Physik*, v. 148, no. 2, 1957, p. 209-217.

Investigation of ultrasonic effect on electrical conductivity of Se crystals. The hexagonal modification shows high piezoelectric properties.

11998* (Russian.) Investigation of Heat Conductivity of PbTe. **Issledovanie teplonrovodnosti telluristogo svintsa.** E. D. Deviatkova. *Zhurnal Tekhnicheskoi Fiziki*, v. 27, Mar. 1957, p. 461-466.

Studies made on material that could be used in the production of thermoelectric batteries. Investigates the possible mechanisms of heat conductivity in semiconductors.

See also: ***11197*** (electrical conductivity of alloys); **11411** (adsorption of hydrogen on tungsten); **11532** (strength of steel reinforced Al conductor joints); **11550** (properties of electrical-contact materials); **11560** (free energy of formation of PbS, Ag_2Se, and AgTe); **11784** (wear resistance of steels); **11790** (scoring of metals); **11931** (strength of malleable

iron); **12004** (temper brittleness); **12041** (deformation of Cu-Sb alloys); **12042** (properties of boron steels); **12045** (deformation twinning in Cu); **12047** (mechanical properties of alloy steels); **12048** (fatigue of Cu); **12050** (properties of Ni-Cr-Fe alloys); **12052** (electrical resistance of Al-Ga alloys); **12058** (slip in steel); **12061** (properties of Ba films); **12074** (magnetic properties of powder-metal magnets); **12262** (evaporation of metal crystals); **12436** (brittle fractures in ship steels).

METALS—MECHANICAL WORKING

11999 Turning High-Tensile Steels. *Aircraft Production*, v. 19, May 1957, p. 204-206.

Introduction of skiving-tool for bar-turning operations on heat-treated steels.

12000* (German.) Flexibility of Aluminum Cable Sheaths. **Die Biegefähigkeit von Kabelmänteln aus Aluminium.** K. H. Hahne. *Aluminium*, v. 33, May 1957, p. 325-331.

Necessary flexibility is attained by corrugating the sheath.

12001 Forces and Power Required to Turn Aluminum and Seven Alloys. O. W. Boston and W. W. Gilbert. *ASME, Transactions*, v. 79, May 1957, p. 909-914.

Turning tests on pure Al 1100-H14 and seven Al alloys were made to develop a formula for the tangential cutting force as a function of the material constant, the feed in inches per revolution, and the depth of cut in inches, when cutting dry, with a solid high-speed steel tool ground for turning Al.

12002 Comparative Machinability of B1113, C1213, C1120HR, C1120CD, and C1119 Steels. H. L. Bryden. *ASME, Transactions*, v. 79, May 1957, p. 915-919.

Tests with C1119 steel indicated an average tool life six times greater than that of the best B1113 and C1213 steels and nine times the tool life of the average of seven varieties of B1113 and C1213 steels.

12003* Tomorrow's Machining Concept — Optimation. Harry Conn. *Automatic Machining*, v. 18, May 1957, p. 37-48.

Combines metal cutting research, advanced tool engineering, and economics to determine by formula the feed and speed that will give the lowest unit part cost.

12004 Effect of Cold Reduction on Irreversible and Reversible Temper Brittleness. M. M. Shteinberg, V. D. Sadovskii, and A. V. Demakova. *Henry Brutcher Translation No.* 3812, 14 p. (Abridged from *Metallovedenie i Obrabotka Metallov*, v. 2, no. 6, 1956, p. 26-35.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 14809, v. 5, Nov. 1956.

12005* (Russian.) Hot Working of Vicalloy. **Termomekhanicheskaia obrabotka splava vikalloi.** Ia. S. Shur, M. G. Luzhinskaia, and L. A. Shubina. *Fizika Metallov i Metallovedenie*, v. 4, no. 1, 1957, p. 60-69.

Study of the effect of hot working on highly coercive alloys. The alloy tested contained 52% Co, 12% V, and the balance Fe. The samples consisted of cold-drawn wires of 0.1 to 3.0 mm. dia.

12006 The Pressure for the Cold Extrusion of Lubricated Rod Through Square Dies of Moderate Reduction at Slow Speeds. W. Johnson. *Institute of Metals, Journal*, v. 85, May 1957, p. 403-408.

When pure Pb is used in extrusion experiments, an empirical relationship between the pressure and the reduction may easily be obtained and also a measure of the mean strain imparted to the product, uncomplicated by strain-hardening effects.

12007 How to Get More for Your Metalworking Dollar. IX. Stamping. *Iron Age*, v. 179, May 30, 1957, p. 97-112.

Some ways to improve design for best stamping results.

12008 Modern Techniques in the Cold Reduction of Sheet and Tin Plate. E. N. Archibald. *Iron and Steel Engineer*, v. 34, May 1957, p. 141-146.

12009 Machine Tools for Metal Cutting. W. H. Armstrong. 347 p. 1957. McGraw-Hill, New York. (TJ1185 Ar58m)

A one-semester text designed to give engineering students technical information about materials, tools, and processes that will aid them in machine design, time study, production planning and control, and similar areas connected with manufacturing machine-shop products.

12010 The Accurate Measurement of Wear Scars on Cutting Tools. J. Taylor. *Machinery (London)*, v. 90, Apr. 26, 1957, p. 927-934.

Modifications required for improving the accuracy of wear measurements by microscopes. The wear scar planimeter and its use for plotting tool wear curves.

12011* Carbide Boring Bars Cut Time 50%. Omer W. Nichols. *Metalworking Production*, v. 101, Apr. 26, 1957, p. 715-717.

Solid carbide boring bars and grinding quills reduce machining time 50%, eliminate chatter, promote longer tool life, and help maintain parallelism in long bores. Steel bushings, sleeves, and tips are brazed to carbide bars to simplify tool-holding.

12012* A Method of Assessing the Progress and Behavior of Wear Patterns on Tungsten Carbide Tools and Some Possibilities for Interpretation. E. Y. C. Sun and W. B. Heginbotham. *Microtecnic (English Ed.)*, v. 11, no. 2, 1957, p. 71-75.

Apparatus and techniques.

12013* Cost Cutting With Grinding Wheels. IV. Cut-Off Wheel Selection. John A. Mueller. *Modern Castings*, v. 31, June 1957, p. 71-72.

Considers grit size, wheel thickness, and wheel grade.

12014 Use of a Chip Method to Produce Homogeneous Aluminum-Uranium Alloy Foils. W. L. Larson and J. L. Klein. *Nuclear Metals Inc. (U. S. Atomic Energy Commission)*, NMI-1168, Dec. 1956, 65 p. (UF767 Un3.1nm Contin.)

Conventional alloy ingots are machined completely into chips, degreased, and thoroughly mixed by tumbling. Chips are then cold-compacted, canned, evacuated, hot compacted, hot extruded into a ⅜" x 1⅝" flat, cold rolled, and milled to the proper width.

12015 Ultrasonic Machining. I. Technique and Equipment. E. A. Neppiras and R. D. Foskett. *Philips Technical Review*, v. 18, no. 11, 1956-1957, p. 325-334.

Several ultrasonic drilling machines and their applications are described. (To be continued.)

12016* (Russian.) Perfection of the Technology of Rolling Tubes From Ingots. **Uluchshenie tekhnologii prokatki trub iz slitkov.** V. V. Shveikin and L. N. Karpenko. *Stal'*, v. 17, Apr. 1957, p. 340-342.

Technology of tube rolling was improved by using polyhedral ingots instead of round ones, a new mandrel, and a new double-bevel grooving of the piercing mill rolls.

12017 Shot Peening. *Steel Processing and Conversion*, v. 43, May 1957, p. 260-266.

Review of equipment and methods.

12018* (English.) **An Analytical Study on Grinding Temperature.** Kenji Sato. *Technology Reports, Tôhoku University*, v. 21, no. 2, 1957, p. 255-290.

The proportion of heat conducted to the work, the chip, and the wheel was studied experimentally and analytically in the case of SF-54 steel grinding with an Al_2O_3 wheel, without coolant.

See also: **11082** (refractories for slab heating furnace); **11788** (metalworking lubricants); **11895** (shot peening applications); **11946** (boring of structural steel); **12029** (rolling of uranium rods); **12086** (thickness measurement in strip mill).

METALS—METALLOGRAPHY, TRANSFORMATIONS, AND STRUCTURES

12019 (English.) **Origin of Strengthening on Precipitation: Ordered Particles.** R. O. Williams. *Acta Metallurgica*, v. 5, May 1957, p. 241-244.

An analysis is given to show that the presence of order in precipitate particles can give rise to considerable strengthening even in the absence of strains. Some of the implications of this are given and systems which might owe their strength to this mechanism are discussed.

12020 (English.) **Strain-Ageing of Aluminium-Magnesium Alloys at Temperatures Between 208° and 239°K.** A. R. C. Westwood and T. Broom. *Acta Metallurgica*, v. 5, May 1957, p. 249-256.

The strain-aging of Al-Mg alloys was studied as a function of composition (0.5 to 3% Mg) and prestrain (1 to 15% extension).

12021 (English.) **Calculation of the Nickel-Chromium-Copper Phase Diagram From Binary Data.** J. L. Meijering. *Acta Metallurgica*, v. 5, May 1957, p. 257-264.

In the solid state the Ni-Cr-Cu system shows phase equilibrium between a Cr-rich b.c.c. phase and two f.c.c. phases in Ni and Cu respectively.

12022 (English.) **Self-Diffusion in Indium Antimonide and Gallium Antimonide.** Fred H. Eisen and C. Ernest Birchenall. *Acta Metallurgica*, v. 5, May 1957, p. 265-274.

A tracer technique was used, in which layers were removed from the crystal progressively and the residual activity in the crystal was counted after each section was taken.

12023 (English.) **On Radiation-Induced Irreversible Changes in Metals and Alloys and the "Temperature-Spike" Concept of Radiation Damage.** Roger Chang. *Acta Metallurgica*, v. 5, May 1957, p. 275-280.

The temperature distribution in the immediate neighborhood of a primary knockon between fast neutrons and a heavy metal, or the "temperature spike," is calculated and correlated with the induced irreversible changes in the metal.

12024 (English.) **Dislocation Etch Pits in Silicon Iron.** J. C. Suits and J. R. Low, Jr. *Acta Metallurgica*, v. 5, May 1957, p. 285-289.

It was demonstrated that the segregation of carbon to dislocation sites is a necessary prerequisite to the production of etch pits in slip bands in silicon ferrite.

12025* (Russian.) A More Precise Determination of the Equilibrium Diagram of the Fe-As System. **Utochnenie diagrammy sostoianiia sistemy zhelezo-mysh'iak.** V. N. Svechnikov and A. K. Shurin. *Akademii Nauk Ukrains'koi RSR, Dopovidi*, no. 1, 1957, p. 27-29.

Alloys studied contained 0 to 12.5% As, 0.016 to 0.020% C. The liquidus and solidus curves and the boundaries of the $\alpha + \gamma$ field were determined.

12026* (Russian.) Ternary Solid Solutions in the System Cu-Mg-Cd. **Troinye tverdye rastvory v sisteme med'magnii-kadmii.** E. E. Cherkasin, P. I. Kripiakevich, and D. P. Frankevich. *Akademii Nauk Ukrains'koi RSR, Dopovidi*, no. 1, 1957, p. 33-37.

Structure and solubilities of alloys containing 10.0 to 66.7 at. % Cu.

12027* (German.) Stress Relief and Recrystallization of Aluminum (New Investigations). **Entfestigung und Rekristallisation des Aluminiums (Neuere Untersuchungen). II.** D. Altenpohl. *Aluminium*, v. 33, May 1957, p. 306-317.

Effects of rate of heating, degree of reduction in cold rolling, purity, various additions, hardening, and nature of grain boundaries.

12028* (German.) Application of Thin Metal Foils as Image Amplifiers in X-Ray Techniques. **Zur Anwendung dünner Metallfolien als Bildverstärker in der Röntgentechnik.** Fritz Günther and Bruno Beyer. *Archiv für das Eisenhüttenwesen*, v. 28, Apr. 1957, p. 207-212.

A study of the image-amplifying effect of Pb, Sn, Zn, and Cu foils in X-ray structural studies.

12029 Effect of Rolling Temperature on the Preferred Orientation in Rolled Uranium Rods. M. H. Mueller and H. W. Knott. *Argonne National Laboratory (U. S. Atomic Energy Commission)*, ANL-5329, Mar. 1957, 31 p. (UF767 Un3.1an Contin.)

12030* (German.) Atlas of Heat Treatment of Steel. **Atlas zur Wärmebehandlung der Stähle.** Franz Wever, Adolf Rose, Walter Peter, Werner Strassburg, and Leo Rademacher. Sections individually paged. 1956. Verlag Stahleisen M.B.H., Dusseldorf, Germany. (TN731 At65 Ref.)

Comprehensive review of treatment and characteristics of many C and alloy steels. Covers transformation processes, time-temperature relationships, isothermal transformations, phase diagrams, and quenching and hardening processes; effect of steel composition on optimum heat-treating procedures.

12031 Characteristic Temperatures of Cubic Metals. E. E. Budzinski and H. Schiff. *Canadian Journal of Physics*, v. 35, May 1957, p. 507-511.

An approximation is developed for the determination of the characteristic Debye temperatures of cubic crystals.

12032* (French.) Orientation of the Cobalt Precipitant in a Cu-Co Alloy. **Orientation des précipitations de cobalt dans un alliage CuCo.** Louis Weil, Lucie Gruner, and André Deschamps. *Comptes Rendus*, v. 244, Apr. 15, 1957, p. 2143-2146.

Magnetic measurements, taken at very low temperatures, showed that the segregated Co phase in a drawn alloy showed a preferred orientation which might be due to the epitaxy of Co in Cu or to the elongated form of the precipitates.

12033 Constitution of Indium Alloy Systems. E. A. Peretti. 93 p. 1956. Indium Corporation of America, Utica. (QD181.I5 P41c)

Includes phase diagrams for numerous binary, ternary, quaternary, and quinary systems.

12034* (Russian.) Study of Carbon Diffusion in Nickel and Its Alloys by Means of the Radioactive Isotope C^{14}. **Izuchenie diffuzii ugleroda v nikele i ego splavakh pri pomoshchi radioaktivnogo izotopa C^{14}.** P. L. Gruzin, Iu. A. Polikarpov, and G. B. Fedorov. *Fizika Metallov i Metallovedenie*, v. 4, no. 1, 1957, p. 94-102.

12035* (Russian.) Effect of Vacuum and Overheating Temperature on the Structure of Cast Iron. **Vliianie vakuuma i temperatury peregreva na strukturu chuguna.** I. E. Brainin and S. I. Shapovalo. *Fizika Metallov i Metallovedenie*, v. 4, no. 1, 1957, p. 115-112.

Overheating of liquid cast iron, remelting in a vacuum, and a decrease in S content all lead to a reduction in the amount of graphite.

12036* (Czech.) Possibilities of Using Electron-Emission Microscopy in the Investigation of Metal Structures. **Možnosti použití elektronové mikroskopie při studiu struktur kovů.** Armin Delong, Vladimír Drahoš, Ladislav Bezděk, and Dalibor Růzička. *Hutnické Listy*, v. 12, Mar. 1957, p. 206-215.

An adaptor for the Czech electron table microscope permits use of thermoemission in the examination of the structures of carbon steels in the temperature range from 750 to 900 C during surface activation of the specimen with Ba.

12037* (Czech.) Examination of Ferrite δ Transformation in 18/9/Ti Stainless Steels With Higher Titanium Content. **Sledování přeměny ferritu δ v antikorosních ocelích 18/9/Ti s vyšším obsahem titanu.** Vladimír Čihal and Milan Pražák. *Hutnické Listy*, v. 12, Mar. 1957, p. 236-242.

12038* (Czech.) A Study Concerning the Influence of Tungsten on the Magnitude of the Interlamellar Distance of Pearlite. **Studium vlivu wolframu na velikost mezilamelární vzdálenosti perlitu.** Karel Mazanec. *Hutnické Listy*, v. 12, Apr. 1957, p. 309-315.

An increase in W from 0.42% to 1.50% extends the average interlamellar distance by about 42%.

12039 The Uranium-Lead System. Robert J. Teitel. *Institute of Metals, Journal*, v. 85, May 1957, p. 409-412.

Data on the solubility of U in Pb, obtained by a filtration technique, and on the crystal structure of UPb, obtained by neutron diffraction.

12040 The Lattice Parameters of the Alpha Solid Solutions of Copper-Zinc-Germanium and Copper-Zinc-Gallium Alloys. B. B. Argent and D. W. Wakeman. *Institute of Metals, Journal*, v. 85, May 1957, p. 413-414.

It is shown that the expansion of the Cu lattice caused by the solution of Zn and Ga, or Zn and Ge, may be expressed approximately as the sum of the expansions due to each of the solutes considered individually.

12041 A Note on the Effect of Antimony on Hole Formation During the Diffusion of Zinc From Brass *In Vacuo*. L. M. T. Hopkin. *Institute of Metals, Journal*, v. 85, May 1957, p. 422-424 + 1 plate.

It is shown that during the diffusion of zinc from brass heated *in vacuo* the presence of antimony increases the formation of the holes, associated with the Kirkendall effect, which are attributable to the precipitation of excess vacancies. The severe intergranular brittleness encountered in Cu-Sb alloys during plastic deformation at elevated temperatures arises from the effect of antimony in promoting the precipitation of excess vacancies produced by the deformation.

12042 The Physical Metallurgy of Low-Carbon, Low-Alloy Steels Containing Boron. K. J. Irvine, F. B. Pickering, W. C. Heselwood, and M. Atkins. *Iron and Steel Institute, Journal*, v. 186, May 1957, p. 54-67.

Boron increases the period of induction for polygonal ferrite formation and this effect increases linearly with B content up to 0.002%. Effects of transformations and composition on mechanical properties.

12043 A High-Temperature X-Ray Study on High-Speed Steel. I. The Lattice Expansion of Matrix and Carbide. II. Transformations During Tempering and Some Considerations on Martensite-Type Reactions. H. J. Goldschmidt. *Iron and Steel Institute, Journal*, v. 186, May 1957, p. 68-85.

12044* (Swedish.) Decomposition of Delta-Ferrite in High Alloy Steels. **Delta-ferritens sönderfall i höglegerade stål.** Kehsin Kuo. *Jernkontorets Annaler*, v. 141, no. 3, 1957, p. 146-174.

Studies the decomposition of Fe-M-C ternary systems where M represents V, Cr, Mo, or W.

12045 X-Ray Determination of Conjugate Deformation Twins in Copper. F. A. Sherrill, M. C. Wittels, and T. H. Blewitt. *Journal of Applied Physics*, v. 28, May 1957, p. 526-529.

Deformation twins related to two separate (111) orientations were observed in a Cu single crystal deformed by tensile extension at 4.2 K. The unambiguous determination of the twin relationships is accomplished by a unique X-ray technique which makes use of a single crystal adapter and Geiger counter methods.

12046 Phase Transition Temperature of Polonium. J. M. Goode. *Journal of Chemical Physics*, v. 26, May 1957, p. 1269-1271.

Transition of α to β Po occurs at 54 ± 1.5 C and the β to α transition occurs at 18 ± 1.5 C.

12047 Some Observations on Ferrite-Carbide Aggregates in Alloy Steels. E. S. Davenport. *Journal of Metals*, v. 9; *American Institute of Mining and Metallurgical Engineers, Transactions*, v. 209, May 1957, p. 677-688.

Microstructure and mechanical properties of ferrite-carbide aggregates in an alloy steel of eutectoid carbon content.

12048* Fatigue Failure—A Structure Study. A. A. Krishnan and K. D. Maji. *Journal of Scientific & Industrial Research*, v. 16B, Mar. 1957, p. 105-116.

Appreciable change in structure involving alteration in shape of grains with the partial formation of crystallites having random orientation takes place both above and below the endurance limit in Cu.

12049* (Russian.) Methods of Investigating Cast Iron Graphitization Kinetics. **K voprosu o metodike issledovaniia kinetiki grafitizatsii chuguna.** Ia. V. Grechnyi and N. M. Danil'chenko. *Liteinoe Proizvodstvo*, no. 3, Mar. 1957, p. 20-22.

Critical review of test methods.

12050 Sigma Formation in Commercial Ni-Cr-Fe Alloys. Francis B. Foley and Vsevelod N. Krivobok. *Metal Progress*, v. 71, May 1957, p. 81-86.

The sigma phase, usually blamed for embrittlement, may be accompanied by more subtle phenomenon as a contributing factor.

12051 Modern Metallographic Equipment. J. C. Wright. *Metal Treatment and Drop Forging*, v. 24, May 1957, p. 175-180.

New techniques and equipment for specimen preparation and electropolishing; metallurgical microscopes and objectives. (To be continued.)

12052* (German.) The System Aluminum-Gallium and the Effect of Gallium Additions on the Electrical Resistance of Aluminum. **Das System Aluminium-Gallium und die Beeinflussung des elektrischen Widerstandes von Aluminium durch Gallium-Zudsätze.** H. Zoller. *Metall*, v. 11, May 1957, p. 378-381.

12053* (Russian.) Mechanism of the Effect of Low-Temperature Soaking of White Cast Iron on the Number of Graphitization Centers After Annealing. **Mekhanizm vliianiia nizkotemperaturnoi vyderzhki belogo chuguna na kolichestvo tsentrov grafitizatsii pri posleduiushchem otzhige.** G. I. Ivantsov. *Metallovedenie i Obrabotka Metallov*, no. 4, Apr. 1957, p. 9-16.

The lower the temperature of preliminary soaking, the greater is the effect on graphitization; optimal soaking is 4 hr. at 320 C. The effectiveness of low-temperature soaking may be increased considerably by introducing Al (a few hundredths of 1%) into the cast iron melt.

12054* (Italian.) Titanium Metallography. **La metallografia del titanio.** D. Gualandi. *Metallurgia Italiana*, v. 49, Mar. 1957, p. 149-158.

Mechanical and electrolytic polishing methods. Etchants. Effects of alloying elements on structure. Transformations. Properties.

12055* (German.) Investigations of the Ternary Systems Molybdenium-Silicon-Boron, Tungsten-Silicon-Boron and of the System VSi_2-$TaSi_2$. **Untersuchungen in den Dreistoffsystemen: Molybdän-Silizium-Bor, Wolfram - Silizium - Bor und in dem System: VSi_2-$TaSi_2$.** H. Nowotny, E. Dimakopoulou, and H. Kudielka. *Monatshefte für Chemie*, v. 88, no. 2, 1957, p. 180-192.

Determination of equilibrium diagrams. Properties of various phases.

12056 Electronic Properties of Th, U, and Pu. II. Energy Band Structure of Metallic Phases. Guy W. Lehman. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-1839, May 1957, 50 p. (UF767 Un3.1na Contin.)

An interpolation method for determining the energy levels for the metallic phases of the actinide elements is presented.

12057 On the Texture of Evaporated Films. R. B. Kehoe. *Philosophical Magazine*, v. 2, ser. 8, Apr. 1957, p. 455-466 + 2 plates.

Copper, Ag, and Au were evaporated onto heated cleavage surfaces of alkali halide crystals in an electron diffraction camera. The diffraction patterns were studied continuously as the depositions were carried out and the crystalline arrangement in the films was deduced as a function of thickness.

12058 Metallography of a Medium Carbon Steel Subjected to Slow and Impact Compression. J. D. Campbell, J. Duby, and K. E. Puttick. *Philosophical Magazine*, v. 2, ser. 8, Apr. 1957, p. 548-553 + 4 plates.

In slow deformation, coarse slip in ferrite occurs in very narrow regions on corrugated surfaces; this behavior appears to be related to the presence of an aging precipitate. Coarse slip is absent in rapidly strained steel; the metal deforms by fine slip which occasionally forms deformation bands.

12059 Internal Friction and Defect Interaction in Germanium: Experimental. J. O. Kessler. *Physical Review*, v. 106, ser. 2, May 15, 1957, p. 646-653.

The logarithmic decrement of Ge crystals undergoing small-amplitude longitudinal forced vibrations was measured as a function of temperature, frequency, and concentration of impurities and edge dislocations.

12060 New Collision Theory of Cathode Sputtering of Metals at Low Ion Energies. Erich B. Henschke. *Physical Review*, v. 106, ser. 2, May 15, 1957, p. 737-753.

Cathode sputtering is conceived as being produced by purely mechanical collisions between the impinging ions and surface atoms of the target. Energy is lost during the collisions by excitation of Debye waves in the lattice. The collisions are assumed to occur as between perfectly elastic spheres with radii determined by the largest closed electronic shells of the ion and the target atom.

12061* (English.) **The Structure of Evaporated Barium Films.** Yoshihiko Mizushima, Zenjiro Oda, and Osamu Ochi. *Physical Society of Japan, Journal*, v. 12, Apr. 1957, p. 355-368.

Granular structure plays an important role in electrical resistance as well as in N sorption. At and below room temperature, marked decrease of electrical resistivity and low-temperature sorption of N take place with the recovery of imperfections.

12062* (Polish.) Investigations on the Formation of a Bright Pearlitic Rim in the Structure of Black Heart Malleable Iron Castings. **Badania nad powstawaniem jasnej "obwódki" w strukturze odlewów z czarnego żeliwa ciągliwego.** Jan Rączka and Jerzy Piaskowski. *Prace Instytutu Odlewnictwa*, v. 5, no. 2/55, 1956, p. 43-51.

The quantity of graphitization nuclei near the surface of castings is a decisive factor in the pearlitic rim appearance. The rim may be removed by pre-heating the cast iron to a temperature above 600 C and subjecting it to air cooling before annealing.

12063 Metallographic Study of Hot Dipped Zinc Coatings. A. T. Baldwin and W. H. McMullen. *Products Finishing*, v. 21, June 1957, p. 86 + 5 pages.

12064* (French.) Combined Impedance Analysis and Dilatometry of Transformations in Metals and Alloys. **Analyse par impédance et dilatométrie combinées des transformations dans les métaux etalliages.** Hervé Guyot. *Recherche Aéronautique*, no. 57, Mar.-Apr. 1957, p. 51-57.

Description of an apparatus for impedance analysis and measurement of volume change simultaneously. Application to nonferromagnetic and ferromagnetic metals and to a refractory non-ferromagnetic alloy. Allotropic transformations of electrolytic Co.

12065* (English.) **Crystal Habits of Silicon Crystallized in Al-Si Alloys.** Ichiji Obinata and Noboru Komatsu. *Science Reports of the Research Institutes, Tôhoku University*, ser. A, v. 9, Apr. 1957, p. 107-117.

Aluminum-20% Si alloys are electrolized to recover granular, prismatic, and platy-form crystals.

12066* (Russian.) Determination of Ferrite Phase in Joint Metal by Magnetic Method. **Opredelenie ferritnoi fazy v metalle shva magnitnym metodom.** B. I. Lazarev and S. D. Entin. *Svarochnoe Proizvodstvo*, no. 4, Apr. 1957, p. 5-8.

A magnetic method and apparatus for determination of quantity of ferrite phase in specimens from austenitic seams within a few seconds.

12067* (German.) Contributions to Texture and Anisotropy of Cold-Rolled and Recrystallized Iron-Cobalt-Vanadium Alloys Containing 50% Cobalt. **Beiträge zur Textur und Anisotropie kaltgewalzter und rekristallisierter Eisen-Kobalt-Vanadium-Legierungen mit einem Gehalt von 50% Kobalt.** E. Houdremont, K. Janssen, G. Sommerkorn, and H. Fahlenbrach. *Technische Mitteilungen Krupp*, v. 15, Apr. 1957, p. 13-22.

The increase of V content, or the partial replacement of it by Cr, within Fe-Co-V alloys results in the formation of a face-centered lattice. These alloys are practically unmagnetizable. By means of deformation, the cubically face-centered lattices are converted into space-centered ones. Subjected to annealing, these alloys acquire high permanent-magnet properties. Analyzes the variation in texture as a function of the basic lattice, and of possible modifications during deformation and annealing.

12068* (Russian.) Diffusional Porosity in Metals and Alloys. **Diffuzionnaia poristost' v metallakh i splavakh.** Ia. E. Geguzin. *Uspekhi Fizicheskikh Nauk*, v. 61, Feb. 1957, p. 217-247.

Diffusional porosity appearing during the reciprocal diffusion of metals. Theoretical principles. Change in the volume of the diffusion sample during the process. Diffusional porosity in one-component systems. Crystal lattice vacancies. Origin of diffusion pores. Sintering mixtures of powdered metal.

12069* (Russian.) Structure of Liquid Metals. **Stroenie zhidkikh metallov.** I. V. Radchenko. *Uspekhi Fizicheskikh Nauk*, v. 61, Feb. 1957, p. 249-276.

Atomic arrangements in crystals. Practical conditions for X-ray examination of liquid metals. Structural data.

12070* (German.) Etching Arsenide of Gallium. **Ätzversuche an Galliumarsenid.** Hans Achim Schell. *Zeitschrift für Metallkunde*, v. 48, Apr. 1957, p. 158-161.

Etching technique to reveal dislocations.

12071* (German.) Metallographic Preparation of Noble Metal Samples by Electrolytic Lapping. **Metallographische Präparation von Edelmetallproben durch Elektrolytisches Wischpolieren.** Gerhard Reinacher. *Zeitschrift für Metallkunde*, v. 48, Apr. 1957, p. 162-170.

12072* (German.) Construction of a Hot Stage for High Temperature Microscopic Investigation of Metal, and Applications. **Aufbau eines Heiztisches für die Hochtemperatur-Metallmikroskopie und Anwendungsbeispiele.** Irmtraud Pfeiffer. *Zeitschrift für Metallkunde*, v. 48, Apr. 1957, p. 171-175.

12073* (German.) Study of the Structural Family of NiAs. **Zur Systematik der Strukturfamilie des NiAs. II.** Importance of Some Structural Phenomena Based on Proposed Spatial Correlations. **Deutung einiger struktureller Erscheinungen auf Grund von Ortskorrelationsvorschlägen.** Konrad Schubert and Paul Esslinger. *Zeitschrift für Metallkunde*, v. 48, Apr. 1957, p. 193-200.

See also: **11553** (structure of Fe electrodeposits); **11903** (formation of nodular graphite in cast iron); **11919** (graphite spheroids in cast iron); **11925** (isothermal austenite transformation); **11950** (order-disorder in Fe_3Al); **11951** (structure of deformed Al); **11952** (structure of cast iron); **11953** (recrystallization of uranium); **11958** (effects of ferrite networks on steels); **11967** (structure of tool steels); **11976** (electronic structure of Pd-U alloys); **12257** (lattice defects in crystals); **12280** (moving boundary problems in diffusion).

METALS—POWDER

12074* (Russian.) Relationship Between Magnetic Properties of Permanent Powder-Metal Magnets and Porosity. **Zavisimost' magnitnykh svoistv metallokeramicheskikh postoiannykh magnitov ot poristosti.** A. B. Altman. *Fizika Metallov i Metallovedenie*, v. 4, no. 1, 1957, p. 84-88.

A straight-line relationship exists between the values of residual induction and maximum magnetic energy, on the one hand, and the concentration of pores on the other.

12075* (French.) Little Known Aspects of the Role of Cobalt in Sintering Hard Alloys. **Aspects méconnus du rôle joué par le cobalt dans le frittage des alliages durs.** René Bernard. *Métallurgie et la Construction Mécanique*, v. 89, Apr. 1957, p. 307 + 3 pages.

Metallographic examination of double carbides with low Co content. Influence of decarburization on physical properties.

12076 Atmospheres for Sintering Furnaces. N. K. Koebel. *Metal Progress*, v. 71, May 1957, p. 91-98.

Protective atmospheres generated in the same types of equipment as widely installed in modern heat treating departments are considered.

12077 Production of High Purity Uranium Powder. R. G. Bellamy and J. H. Buddery. *Nuclear Power*, v. 2, May 1957, p. 175-179.

A non-pyrophoric, spherical-particled U powder can be produced at high extraction efficiencies by Ca reduction of UO_3.

12078 Characterization of Sinterable Oxide Powders. John F. Quirk. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, TID-7530, Apr. 1957, p. 55-65. (UF767 Un3ti Contin.)

Beryllia powders made from four different lots of $Be(OH)_2$ showed a wide range of sinterability. The temperatures required for sintering the powder compacts to theoretical density ranged from 2300 to above 3200 F. Lattice parameters, dehydration, surface areas, and refractive indices were determined after calcination in air at 400, 800, 1000, and 1200 C. No simple relation with sinterability in H atmosphere was found.

12079 (German.) Preparation of Uranium Mono-Carbide; Its Behavior Compared With Other High Melting Carbides. **Über die Herstellung von Uranmonokarbid und dessen Verhalten gegenüber anderen hochschmelzenden Karbidn.** R. Kieffer, F. Benesovsky, and H. Nowotny. *Planseeberichte für Pulvermetallurgie*, v. 5, Apr. 1957, p. 33-35.

12080 Fundamentals of Sintering. I. A. Pranatis and L. Seigle. *Sylvania Electric Products, Inc. (U. S. Atomic Energy Commission)*, SEP-229, Oct. 1956, 20 p. (UF767 Un3.1se Contin.)

Effect of O pressure upon the sintering rate of Cu_2O. Inert-marker sintering studies.

12081* (German.) Synthetic Solids. **Synthetische Festkörper. XII.** The Effect of Oxide and Sulfide Layers on Metal Sintering. **Über den Einfluss von Oxyd- und Sulfidschichten auf das Sintern von Metallen.** H. Magdanz and F. Sauerwald. *Zeitschrift für Physikalische Chemie (Leipzig)*, v. 206, Feb. 1957, p. 261-270.

See also: **11769** (heating element alloy).

NONDESTRUCTIVE TESTING AND QUALITY CONTROL

12082* Automatic Ultrasonic Inspection. *Automation*, v. 2, Apr. 1957, p. 442-443.

A brief description.

12083 Detection of Internal Defects in a Large Forging Blank by Ultrasound. F. I. Mikhailov. *Henry Brutcher Translation No.* 3863, 8 p. (From *Vestnik Mashinostroeniya*, v. 36, no. 2, 1956, p. 60-64.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 6822, v. 5, June 1956.

12084 Beta Gauge Checks Steel Thickness. O. H. Bauschinger, Y. M. Chen, and F. H. London. *Electronic Industries & Tele-Tech*, v. 16, May 1957, p. 72 + 5 pages.

Radioactive materials are used to gage continuous processes accurately without touching the material. The measuring process is usually based on the absorption and/or reflection properties of materials to a specific radiation.

12085* Ultrasonic Testing of Heavy Steel Products. Problems in Application and Interpretation. I. M. Mackenzie and R. Kennedy. *Engineering*, v. 183, May 24, 1957, p. 652-655.

12086* Hot Steel Strip Measurement of Thickness During Rolling. *Instrument Practice*, v. 2, May 1957, p. 482-485.

Measurement is performed by non-contact means utilizing a radioactive source on one side of the strip and a radiation detector on the other.

12087* Quality Control in Pressure Die-Castings. J. E. Carvell. *Metal Industry*, v. 90, Apr. 26, 1957, p. 325 + 3 pages.

Chemical and radiographic inspection; visual control; dimensional control; weight test; checking cores and ejectors.

12088* (Italian.) Some Considerations on the Interpretation of Ultrasonic Examinations. **Alcune considerazioni sull'interpretazione degli esami ultrasonori per la ricerca dei difetti nell'acciaio.** E. Marianeschi and T. Tili. *Metallurgia Italiana*, v. 49, Apr. 1957, p. 275-289.

Principles of ultrasonic examination. Development of a technique for the differentiation between internal cracks and slag inclusions.

12089 Development of Filmless Technique for Recording Defects in Ship Welds. J. I. Bujes. *National Academy of Sciences, National Research Council, Report No.* SSC-104, Feb. 1957, 35 p. (VM1 Un3.7s Contin.)

Concludes that, at present, the scintillator is the most useful detector of gamma radiation

12090 Further Studies of an Electronic Thickness Gage: Circuitry, Operating Characteristics, and Calibration. Frederick P. Brodell and Abner Brenner. *Plating*, v. 44, June 1957, p. 591-601.

12091 A Technique for Inspecting and Measuring Wall Thicknesses of Transparent Articles. W. R. B. Frank and L. Green. *Society of Glass Technology, Journal*, v. 40, Aug. 1956, p. 319T-337T.

Refraction and the resulting distortion can be prevented by immersing articles in a liquid which has the same refractive index, thus enabling accurate measurements of the cavity dimensions and of wall thickness to be made by projecting the image onto a screen. Suitable liquids are described.

12092* (French.) Sensitometric Investigation of the Best Conditions Governing the Use of Radioactive Sources in the Gamma-Ray Examination of Steel. **Recherche par voie sensitométrique des conditions d'emploi optimum des sources radioactives en gammagraphie de l'acier.** H. de Leiris and E. Antoni. *Soudage et Techniques Connexes*, v. 11, Mar.-Apr. 1957, p. 83-92.

A comparison of formulas for the selection of an emulsion as a function of the type of inspection to be made.

12093* (French.) Use of Superficial Colorations Produced by Hot Oxidation as a Non-Destructive Testing Method in Spot Welding. **Utilisation des colorations superficielles résultant de l'oxydation à chaud comme moyen de contrôle non destructif en soudage par points.** P. Joumat. *Soudage et Techniques Connexes*, v. 11, Mar.-Apr. 1957, p. 93-99 + 2 plates.

Method for ascertaining the efficiency of heat treatment under electrode tips without destroying the spot welds.

See also: **11170** (nondestructive testing of generator brushes).

NUCLEAR PHYSICS, NUCLEONICS, AND RADIATION

12094* Nuclear Radiation Detection and Measurement. F. W. Hutchinson. *Air Conditioning, Heating, and Ventilating*, v. 54, June 1957, p. 91-99.

Instruments and techniques.

12095 Comparison of Calder Hall and PWR Reactor Types. A. Puishes, D. P. Herron, D. R. Mash, and J. W. Webster. *American Radiator and Standard Sanitary Corp. (U. S. Atomic Energy Commission)*, AECU-3398, Mar. 1957, 76 p. (UF767 U3au Contin.)

Economic and technical comparison.

12096 Interaction of Beta Particles With Matter. Ralph H. Müller. *Analytical Chemistry*, v. 29, June 1957, p. 969-975.

Of the several phenomena involved in the interaction of β particles with matter, systematic studies on the relative backscattering of β by matter have shown that simple regularities obtain for all elements and compounds, and that these can be measured with high precision.

12097 Physics Division Summary Report. *Argonne National Laboratory (U. S. Atomic Energy Commission)*, ANL-5667, Feb. 1957, 99 p. (UF767 Un3.1an Contin.)

An informal report on the progress of recent work.

12098 20-MW D_2O-Moderated Experimental Boiling Water Reactor Design Studies. H. P. Iskenderian. *Argonne National Laboratory (U. S. Atomic Energy Commission)*, ANL-5685, Feb. 1957, 32 p. (UF767 Un3.1an Contin.)

Critical enrichments; temperature coefficients; effects of small amounts of H_2O in the D_2O; effects of power excursions on reactivity.

12099 The Mighty Mouse Research Reactor Preliminary Design Study. L. E. Link, W. H. Cook, H. Greenspan, C. N. Kelber, J. Ramuta, and B. I. Spinrad. *Argonne National Labor-*

atory (U. S. Atomic Energy Commission), ANL-5688, Mar. 1957, 84 p. (UF767 Un3.1an Contin.)

Proposed design of a 250-mw. heterogeneous reactor, with a peak thermal neutron flux level of about 5×10^{15}n $(cm^2)(sec)$ features a D_2O-cooled, moderated, and reflected annular core of highly enriched, Mg-clad fuel elements contained in a pressure vessel approximately 13 ft. in diameter.

12100 Styrofoam Simulation of Boiling and Temperature Effects in the EBWR Cold Critical Experiments J. A. DeShong, Jr. *Argonne National Laboratory (U. S. Atomic Energy Commission)*, ANL-5697, Mar. 1957, 18 p. (UF767 Un3.1an Contin.)

Styrofoam was used successfully to produce voids for zero power reactor representation of hot reactor conditions.

12101* (English.) **Platinum *K* X-Rays From Radium Sources.** Jan Cederlund. *Arkiv för Fysik*, v. 11, no. 5, 1957, p. 431-435.

Rays generated in the walls of a radium container were studied with a scintillation spectrometer.

12102* (English.) **Identification of Fast Charged Particles in Nuclear Emulsions.** T. Johansson and K. Kristiansson. *Arkiv för Fysik*, v. 11, no. 5, 1957, p. 467-479.

The photometric grain density method is less accurate than the scattering-grain density method, but it can be used as a compliment to this method when unexpected results are obtained.

12103 Atomic Energy Applications With Reference to Under-Developed Countries. A Preliminary Survey. B. C. Netschert and S. H. Schurr. 129 p. 1957. Johns Hopkins Press, Baltimore. (QC798 N38a)

The range of applications of nuclear energy; the necessary conditions for efficient use; international cooperation in nuclear energy research and development; United Nations activities.

12104 Atomic Energy in Canada. Clyde C. Kennedy. 95 p. 1956. Atomic Energy of Canada, Ltd., Chalk River, Ontario. (HD9698.C2 K38a2)

An illustrated "facts" book showing the nature and scope of the Canadian program in atomic energy.

12105 Description of Developmental Fast Neutron Breeder Power Reactor Plant. *Atomic Power Development Associates, Inc. (U. S. Atomic Energy Commission)*, APDA-108, Sept. 1955, 104 p. (UF767 Un3.1apd Contin.)

Presents general characteristics of sodium-cooled fast reactors.

12106* Chemical Aspects of Nuclear Power. II. Reactor Material Problems. F. S. Martin. *Atomics & Nuclear Energy*, v. 8, May 1957, p. 168-173.

Chemical aspects of non-metallic reactor components: ceramic fuels, moderators, and cooling and cladding materials.

12107 Atoms for the World. Laura Fermi. 227 p. 1957. University of Chicago Press, Chicago. (QC770 F38a)

The story of U. S. participation in the International Conference on the Peaceful Uses of Atomic Energy held at Geneva in August, 1955. Nontechnical survey of exhibits, activities, and personalities.

12108* The Measurement of the Drift Velocity of Electrons Through Gases by the Electron Shutter Method. R. A. Duncan. *Australian Journal of Physics*, v. 10, Mar. 1957, p. 54-59.

A relation between shutter frequency and drift velocity, and a relation giving the accuracy obtainable by the method in terms of the chamber length and gas pressure are derived.

12109 Annual Report. *Brookhaven National Laboratory (U. S. Atomic Energy Commission)*, BNL 426 (AS-10), July 1956, 116 p. (UF767 Un3.1bn Contin.)

The progress and trends of the research program for the fiscal year 1956 are presented along with a description of the operations, service, and administrative activities of the laboratory.

12110* Formation of an Alpha-Group in the Shell-Model of a Heavy Nucleus. Charles Strachan. *Cambridge Philosophical Society, Proceedings*, v. 53, pt. 2, Apr. 1957, p. 494-507.

By means of a variation principle applied to a nuclear wave function for four nucleons in the field of a closed core, equations are derived giving the relative proportions of a component describing an alpha-particle group and components describing the four nucleons in shell-model states with spin-orbit coupling wave functions, the two neutron states and the two proton states each paired to give zero resultant angular momentum.

12111 Iron 60. Jean-Claude Roy and Truman P. Kohman. *Canadian Journal of Physics*, v. 35, May 1957, p. 649-655.

The long-lived radionuclide Fe^{60} was observed through extraction of its disintegration product, 10-min. Co^{60m}, from the Fe fraction isolated from a Cu target bombarded with 400-m.e.v. protons. Yield considerations indicate the Fe^{60} half-life to be about 3×10^5 yrs., uncertain by a factor of 3.

12112* (French.) Isothermal Treatment at a Low Temperature of Thick Nuclear Plates. **Traitement isotherme à basse température des plaques nucléaires épaisses.** Georges Marguin. *Comptes Rundus*, v. 244, Apr. 29, 1957, p. 2304-2306.

A new method of developing uniform traces of nuclear particles at a minimum of ionization at a constant temperature of 5 C is based on a progressive variation of the pH of the baths. The emulsions keep their initial size, with a negligible deformation and a satisfactory transparency.

12113* (Russian.) Photoproduction of π^0 Mesons on Complex Nuclei. **Fotorozhdenie π^0-mezonov na slozhnykh iadrakh.** A. S. Belousov, E. I. Tamm, and E. V. Shitov. *Doklady Akademii Nauk SSSR*, v. 112, Feb. 21, 1957, p. 1017-1019.

The study of photo-production of π^0 mesons on nuclei at various energies of gamma radiation could tell us whether the mesons originate within the entire volume of the nucleus, or only on its surface.

12114 Tables of Effective Neutron Cross Sections in Water Moderated Reactors. H. Dean Brown. *E. I. du Pont de Nemours & Co., Savannah River Laboratory Technical Division (U. S. Atomic Energy Commission)*, DP-194, Jan. 1957, 35 p. (UF767 Un3.1dp Contin.)

Effective cross sections were computed for nuclides that are exposed to neutrons moderated by H_2O or by D_2O. Tables show the effective cross section and the fraction of events below the Cd cutoff energy as a function of moderator temperature and of effective reactor absorption.

12115 Nuclear Reactors for the Generation of Electrical Power. Christopher Hinton. *Endeavour*, v. 16, Apr. 1957, p. 65-77.

A review of the principal factors which led to the choice of the graphite-moderated gas-cooled reactor for Calder Hall. The future of more advanced types of reactors, with special reference to the Dounreay fast reactor prototype.

12116* (German.) Scattering of Fast Electrons. **Über die Streuung schneller Elektronen.** P. Urban. *Fortschritte der Physik*, v. 5, no. 3, 1957, p. 93-121.

Theory of coulomb scattering of high-energy electrons and positrons. Distribution of charge in heavy nuclei.

12117 Experimental Determination of the Reduction of Induced Activity in Metals by Addition of Boron. J. Moteff, W. J. Stapp, and M. Tetenbaum. *General Electric, Atomic Products Division (U. S. Atomic Energy Commission)*, APEX,292, Feb. 1957, 7 p. (UF767 Un3.1ap Contin.)

Addition of B to irradiated stainless steel, W, and Th results in a decrease in neutron activation.

12118* A Theoretical and Experimental Investigation of Anisotropic-Dielectric-Loaded Linear Electron Accelerators. R. B. R. Shersby-Harvie, L. B. Mullett, W. Walkinshaw, J. S. Bell, and B. G. Loach. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, May 1957, p. 273-292.

Waveguides loaded with a series of dielectric discs can be designed with characteristics suitable for use in linear electron accelerators. A short linear accelerator incorporating this kind of waveguide functioned in accordance with expectations provided the vacuum was obtained with a mercury-diffusion pump and not with an oil-diffusion pump.

12119* Control Instrumentation for Nuclear Reactors. V. *Instrument Practice*, v. 11, Apr. 1957, p. 342-345.

Considers warning systems for indicating visually and aurally when a fault occurs in the reactor plant, and the automatic shut-down when dangerous situations arise.

12120* Practical Aspects of Internal-Sample Liquid-Scintillation Counting. Jack D. Davidson and Philip Feigelson. *International Journal of Applied Radiation and Isotopes*, v. 2, Apr. 1957, p. 1-18.

Liquid-scintillation counting for the assay of radioactive samples, offers excellent sensitivity for weak β-emitting isotopes, including tritium. This is because of its 4π geometry for samples as large as several grams. Disadvantages and applications.

12121 Comparative Yields of Fe^{54} $(\gamma,pn)Mn^{53}$ and Fe^{54} $(\gamma,2n)$ Fe^{52}. Raymond M. Henry and Don S. Martin. *Iowa State College, Ames Laboratory (U. S. Atomic Energy Commission)*, ISC-726, Aug. 1955, 30 p. (UF767 Un3.1is Contin.)

12122 The Alpha Half-Life of Americium-241. G. R. Hall and T. L. Markin. *Journal of Inorganic and Nuclear Chemistry*, v. 4, nos. 3-4, 1957, p. 137-142.

Preparation of AmO_2, $Am_2(SO_4)_3$, and anhydrous $AmCl_3$, used in establishing 458.1 ± 0.5 yr. as the alpha-life of Am^{241}.

12123* Airborne Measurements of Atomic Debris. L. Machta, H. L. Hamilton, Jr., L. F. Hubert, R. J. List, and K. M. Nagler. *Journal of Meteorology*, v. 14, Apr. 1957, p. 165-175.

Radioactivity data collected by airborne equipment during the first of the Nevada atomic tests. The relative values are useful in checking meteorological trajectories and in making crude estimates of lateral diffusion.

12124 The Thermal-Neutron Absorption Cross-Section of U^{233}. T. S. Green, V. G. Small, and D. E. Glanville. *Journal of Nuclear Energy*, v. 4, Apr. 1957, p. 409-417.

The cross-section was found to be 578 ± 17 barns, compared with Au taken as 98.6 barns.

12125 The Analysis of Neutron Spectrometer Resonance Data. J. E. Lynn and E. R. Rae. *Journal of Nuclear Energy*, v. 4, Apr. 1957, p. 418-444.

Methods of analyzing data obtained from transmission, scattering, capture, and fission measurements.

12126 The Reactivity Effect Due to Neutron Streaming in an Empty Tube. E. Critoph and R. M. Pearce. *Journal of Nuclear Energy*, v. 4, Apr. 1957, p. 445-459.

The critical size of a reactor is increased when neutrons can stream along an empty tube passing through the reactor. The effect of removing moderator from tubes inserted in ZEEP was measured for tubes with radii in the range 1 to 8 cm.

12127 Neutron Transport Theory. B. Davison and J. B. Sykes. 450 p. 1957. Oxford University Press, London. (QC173 D29n)

Derivation of the basic transport equation from the relevant physical properties of neutrons; the constant cross-section approximation; energy-dependent problems with spectrum regeneration; slowing-down problems.

12128 The New World of the Atom. James Stokley. 288 p. 1957. Ives Washburn, Inc., New York. (TK9145 St67n)

Historical review of developments in release and harnessing of atomic energy. Present day use of atomic reactors and radioactive isotopes.

12129 Operations Handbook for the North American Aviation, Inc. Research Reactor, Model L-3. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-Memo-850, Dec. 1953, 239 p. (UF767 Un3.1na Contin.)

Description of reactor components; operational procedures; maintenance.

12130 Use of the SRE Fuel in an Exponential Experiment. R. A. Laubenstein. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-Memo-1116, Oct. 1954, 10 p. (UF767 Un3.1na Contin.)

Apparatus and safety precautions in an exponential experiment for investigating nuclear parameters of proposed lattices for Na-graphite reactors.

12131 Organic Moderated Reactor Experiment. First Progress Report, October, 1955-July, 1956. C. A. Trilling. *North American Aviation, Inc. (U. S. Atomic Energy Commission)*, NAA-SR-1700, Mar. 1957, 190 p. (UF767 Un3.1na Contin.)

Data on the site, facilities, reactor, heat transfer system, instrumentation, auxiliary systems and equipment, reactor physics, control and safety, shielding, health physics, reactor operations, and research program.

12132 Progress Report on the Study of Low Probability, High Hazard, Fast Reactor Accidents. R. Daane, R. Mela, and J. DeFelice. *Nuclear Development Associates, Inc. (U. S. Atomic Energy Commission)*, NDA-14-107, Nov. 1955, 55 p. (UF767 Un3.1nd Contin.)

Methods being used to analyze highly hazardous but highly unlikely nuclear accidents. Details of several types of accidents. Analysis of a rapid core collapse and a slow meltdown accident.

12133 Boiling Burnout Progress. John E. Viscardi. *Nuclear Development Corporation of America (U. S. Atomic Energy Commission)*, NDA-13, NDA-22, and NDA-24. Aug. 1955, Nov. 1955, and Feb. 1956. 6, 12, and 51 p. (UF767 Un3.1nd Contin.)

Reports and discussions of experimental results on boiling and related phenomena, such as burnout, maximum heat transfer rates, frequency and formation characteristics of bubbles and vapor films, influence of element shape and surface properties, role of impurities, dissolved gases and pH values, temperature and density distributions, pressure drops, instability, corrosion, cavitation, and metal-water reactions.

12134 Reactor Heat Transfer Progress. John E. Viscardi. *Nuclear Development Corporation of America (U. S. Atomic Energy Commission)*, NDA-26 and NDA-28. Apr. 1956 and July 1956, 40 and 26 p. (UF767 Un3.1nd Contin.)

Concise reports of recent results in high-performance heat transfer research and development for all types of nuclear reactor systems.

12135* Radiation Detectors—A Survey. J. Sharpe. *Nuclear Engineering*, v. 2, May 1957, p. 190-197.

Construction and operational data on various types as an aid in selection for a particular application.

12136 Dounreay. *Nuclear Engineering*, v. 2, June 1957, p. 229-244 + 1 plate.

Details of the Dounreay fast reactor; the sphere; reactor vault; core; core vessel; primary and secondary heat exchangers; civil engineering; and electrical equipment.

12137 Atomic Power Development Associates Progress Report. Final Report Covering Work Through December 31, 1955. R. Evans, L. Minnick, A. Boltax, and R. Duncan. *Nuclear Metals, Inc. (U. S. Atomic Energy Commission)*, NMI-1148, June 1956, 31 p. (UF767 Un3.1nm Contin.)

A U-Cr eutectic alloy (U-5.21 w/o Cr; m.p. 859 ± 10 C) was successfully cast into a radiator section 30" long and containing 125 or 127 tubes. Each casting used iron tubing which had been dry steam oxidized at 1200 F to give an adherent black iron oxide coat approximately 1 mil thick.

12138* Studies in the α-Particle Model of Nuclei. III. Calculation of the Interaction Between α-Particles. A. Herzenberg. *Nuclear Physics*, v. 3, Mar. 1957, p. 1-34.

The interaction energy is divided into direct, polarization, nucleon-exchange, and Coulomb components.

12139* Studies of Inelastic Scattering of 185 MeV Protons on Carbon. H. Tyrén and Th. A. J. Maris. *Nuclear Physics*, v. 3, Mar. 1957, p. 52-59.

Differential cross section of protons were obtained by using a magnetic analyzer.

12140* Further Analysis of the Neutron Component of the Background of Counters Used for ^{14}C Age Measurements. H. De Vries. *Nuclear Physics*, v. 3, Mar. 1957, p. 65-68.

The neutron background fraction was reduced by a factor of about seven by a special arrangement of blocks of paraffin wax (mixed with boric acid) inside the iron shield.

12141* Electric Monopole Transition Rate in Zr^{90}. Martin Deutsch. *Nuclear Physics*, v. 3, Mar. 1957, p. 83-93.

The mean life of the 1.75 m.e.v. excited state in Zr^{90} was found to be 8.5 ± 3 mμ. sec.

12142* On the Universal Interactions. II. K-Meson Decays Into Pions. S. Oneda. *Nuclear Physics*, v. 3, Mar. 1957, p. 97-114.

12143* Excited Levels in Hg^{200} Studied From the Decay of Tl^{200}. C. J. Herrlander and T. R. Gerholm. *Nuclear Physics*, v. 3, Apr. 1957, p. 161-184.

The half-life of Tl^{200} was found to be (26.1 ± 0.4) hr. Conversion lines corresponding to 14 transitions in Hg^{200} were found. In addition, a few unidentified conversion lines were also observed. With the aid of coincidence spectrometer measurements, a level scheme was established, including the following excited levels: 368.0, 947.4, 1574.8, 1594.9, 1659.6, 1732.3, 1776.0, 1884.7, and 2136.7 k.e.v.

12144* The Polarization of 155 MeV Protons Elastically and Inelastically Scattered From Carbon. R. Alphonce, A. Johansson, and G. Tibell. *Nuclear Physics*, v. 3, Apr. 1957, p. 185-192.

The polarization of 155 m.e.v. protons elastically and inelastically (4.43 m.e.v. level) scattered from carbon was measured for angles up to 35° (lab. system). The energy spread of the protons was small enough to allow separation of energy levels by absorbers in a range telescope.

12145* Alpha-Alpha Scattering at 38.5 Mev. W. E. Burcham, W. M. Gibson, D. J. Prowse, and J. Rotblat. *Nuclear Physics*, v. 3, Apr. 1957, p. 217-220.

A measurement of the angular distribution of the scattering of α-particles by He.

12146* Nuclear Surfaces and Zero-Energy Scattering. D. C. Peaslee. *Nuclear Physics*, v. 3, Apr. 1957, p. 255-261.

The assumption of a diffuse nuclear edge introduces computational difficulties in optical model calculations. Discusses an approximation procedure for this case, in which the diffuse edge is replaced by an infinitesimally thin "effective edge" with appropriate reflection and transmission coefficients.

12147 The Homogeneous Aqueous Reactor. R. Hurst, J. Wells, and D. Newby. *Nuclear Power*, v. 2, May 1957, p. 193-195.

Reviews the history of homogeneous reactors and describes a design study recently completed at Harwell on a 100 *MW* (elec) two-zone *HAR* working on the Th-232/U-233 cycle.

12148 Nuclear Reactor Physics. Raymond L. Murray. 317 p. 1957. Prentice-Hall, Englewood Cliffs, N. J. (QC776 M96n)

A practical text and guide for design analysis of nuclear reactors. Principal emphasis is placed on the distributions in energy and space of neutron flux, the determination of the critical amount of fissionable material, and the transient behavior and control of the reactor as a heat source.

12149* Fast Neutron Damaging in Nuclear Reactors. II. The Radiation Damage Function of Graphite. W. Primak. *Nuclear Science and Engineering*, v. 2, Apr. 1957, p. 117-125.

The damage rates in irradiated graphite are explained in terms of the different spectra which existed in the respective irradiation facilities.

12150* Engineering Data for Diphenyl Cooled Nuclear Reactors. L. W. Fromm and Kermit Anderson. *Nuclear Science and Engineering*, v. 2, Apr. 1957, p. 160-169.

Data on vapor pressure, density, specific heat, viscosity, thermal conductivity, and heat transfer film coefficient for diphenyl. Melting points and viscosities of mixtures of diphenyl with higher polyphenyls.

12151* Measurement of Local Heat Transfer Coefficients With Sodium-Potassium Eutectic in Turbulent Flow. K. D. Kuczen and T. R. Bump. *Nuclear Science and Engineering*, v. 2, Apr. 1957, p. 181-198.

12152* Measuring the Ratio of Thermal to Resonance Neutron Densities Using Thick Indium Foils. Moses A. Greenfield, Roscoe L. Koontz, and Alan A. Jarrett. *Nuclear Science and Engineering*, v. 2, May 1957, p. 246-252.

Measurements were made of the Cd ratios of In foils for thicknesses ranging from 0.012 mg/cm² to approximately 100 mg/cm².

12153* Criticality and Flux Calculations for Hydrogenous Assemblies. N. C. Francis, H. Hurwitz, Jr., and P. F. Zweifel. *Nuclear Science and Engineering*, v. 2, May 1957, p. 253-287.

Deals with the calculation of critical parameters, neutron distributions, and adjoint functions for reflected reactors.

12154* Statistical Evaluation of Fission-Product Absorption Cross Sections at Intermediate and High Energies. P. Greebler, H. Hurwitz, Jr., and M. L. Storm. *Nuclear Science and Engineering*, v. 2, May 1957, p. 334-351.

12155* Method of Studying Multi-Region Reactors With an Analog Computer. J. G. Bayly and R. M. Pearce. *Nuclear Science and Engineering*, v. 2, May 1957, p. 352-362.

An electrical analog is described for the study of reactors whose nuclear properties vary with radius. Several neutron velocity groups can be used.

12156 Isotope Milker Supplies Ba^{137} From Parent Cs^{137}. R. L. Newacheck, L. J. Beaufait, Jr., and E. E. Anderson. *Nucleonics*, v. 15, May 1957, p. 122-125.

Gamma milker uses ion-exchange separation and an automatic mechanical injection system to supply repeated amounts of a short-lived γ emitter from a long-lived parent.

12157* (English.) Quantum Statistics of Fields and Multiple Production of Mesons. H. Ezawa, Y. Tomozawa, and H. Umezawa. *Nuovo Cimento*, v. 5, ser. 10, Apr. 1957, p. 810-841.

Thermodynamic relations in quantum field theory. Interaction effects in the multiple production phenomena.

12158* (English.) Phase Shift Analysis of Proton-Proton Scattering Experiments. II. Analysis of the Scattering Data From 18 to 260 MeV. E. Clementel, C. Villi, and L. Jess. *Nuovo Cimento*, v. 5, ser. 10, Apr. 1957, p. 907-920.

12159* (English.) Bubble Density Along the Path of Ionizing Particles Crossing a Bubble Chamber. L. Bertanza, G. Martelli, and B. Tallini. *Nuovo Cimento*, v. 5, ser. 10, Apr. 1957, p. 940-946.

Bubble formation; processes contributing to the formation of track; dependence of the density of bubbles on the velocity of the particles and on the extent of superheating of the liquid.

12160* (English.) On the 7.7 MeV Level of Carbon 12. A. Hossain and D. J. Prowse. *Nuovo Cimento*, v. 5, ser. 10, Apr. 1957, p. 973-976.

12161* (English.) A Triggered Spark Counter. T. E. Cranshaw and J. F. DeBeer. *Nuovo Cimento*, v. 5, ser. 10, May 1957, p. 1107-1117.

The behavior of a triggered parallel plate spark counter was investigated as a possible means of determining the trajectories of ionizing particles. Efficiencies, in an air-spaced counter, were 99%.

12162* (English.) Determination of the Pion-Nucleon Interaction Coupling Constant From Scattering Experiments Using Dispersion Relations. G. Puppi and A. Stanghellini. *Nuovo Cimento*, v. 5, ser. 10, May 1957, p. 1305-1315.

12163 Effects of Heat Generation and Heat Removal on HRT Shutdown and Dump. M. W. Rosenthal and H. C. Claiborne. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, CF-56-2-128, Feb. 1956, 55 p. (UF767 Un3.1cf Contin.)

12164 Gas Cooled, Natural Uranium, D_2O Moderated Power Reactor; Reactor Design and Feasibility Problem. R. C. Dahlberg, et al. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, CF-56-8-207(Del.), Aug. 1956, 155 p. (UF767 Un3.1cf Contin.)

Design and operating characteristics of a gas-cooled, natural-uranium-fueled power-reactor station. A fuel element was devised which allows the D_2O to be kept at a low pressure while the exit gas temperature is high.

12165 Homogeneous Reactor Project. Quarterly Progress Report for Period Ending January 31, 1957. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-2272, Apr. 1957, 179 p. (UF767 U3o Contin.)

Homogeneous reactor tests; reactor design and analysis; engineering development; reactor materials research; chemical en-

gineering development; related chemical research; analytical chemistry.

12166 Some Analytical Solutions of the Slowing Down Problem in Hydrogen. L. Dresner and A. Simon. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission),* ORNL-2276, Apr. 1957, 15 p. (UF767 U3o Contin.)

Two situations are presented for which the slowing down problem in an infinite, hydrogenous medium can be solved explicitly in the P_1, B_1, and Selengut-Goertzel approximations. One case is for all cross sections constant, the other for a non-absorbing hydrogen whose scattering cross section varies as v^s.

12167 Conference on Engineering Education and Nuclear Energy. W. W. Grigorieff, editor. *Oak Ridge Institute of Nuclear Studies, Inc. (U. S. Atomic Energy Commisison),* TID-7527, Apr. 1957, 200 p. (UF767 Un3ti Contin.)

Consists of 22 reports by and for college administrators.

12168 Properties of Some Refractory Fuel Compounds. M. J. Snyder, G. B. Engle, and L. D. Loch. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission),* TID-7530, pt 1, Apr. 1957, p. 141-153. (UF767 Un3ti Contin.)

Available data on the physical properties of 20 refractory compounds of U with C, N, Si, B, Ni, Al, or Fe are tabulated.

12169 Aqueous Homogeneous Research Reactor-Feasibility Study. P. R. Kasten, et al. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission),* ORNL-2256, May 1957, 43 p. (UF767 U3o Contin.)

An evaluation of the technological and nuclear feasibility of a reactor for producing a thermal flux of 5×10^{15} neutrons per sq. cm. per sec.; process operations; experimental facilities; mechanical design of reactor components; processing of fuel solution.

12170 Contributions of Optical Methods to Nuclear Physics. G. Breit. *Optical Society of America, Journal,* v. 47, June 1957, p. 446-459.

A general review of developemnts in nuclear physics which have resulted from the application of optical methods to the study of nuclei. Considers coupling of electron system to nuclear spin; the electron-nuclear volume and shape effect; the hyperfine structure of the isotopes of hydrogen; distribution of nuclear magnetic, isotope shift, and quadrupole moments; and bearing of latter on nuclear models.

12171 Optical Methods of Atomic Orientation and of Magnetic Resonance. Alfred Kastler. *Optical Society of America, Journal,* v. 47, June 1957, p. 460-465.

12172 Low Power Experiments With the Pennsylvania State University Reactor. W. M. Breazeale, R. G. Cochran, R. Misenta, G. Geisler, and W. Sjoborg. *Pennsylvania State University (U. S. Atomic Energy Commission),* NYO-7895, Sept. 1956, 40 p. (UF767 U3ny Contin.)

Experiments included measurements of critical masses with various loadings and reflectors, calibration of the control rod and safety rods, power level determinations, effect on reactivity of flooding a beam hole ending at the active lattice, and effect of placing experimental apparatus against the lattice.

12173 Shielding Requirements for Shipment of Metallurgical Samples. Lee H. Boyer. *Phillips Petroleum Company, Idaho Operations Office (U. S. Atomic Energy Commission),* IDO-16066, Feb. 1953, 24 p. (UF767 Un3.1id Contin.)

A lead-shielded carrier should be provided that has a minimum lead thickness of 6" for side walls and top, and 5" for the bottom. The inside container space should have a minimum diameter of 1½" and a height of 9¾", providing room for two samples.

12174 The Engineering Test Reactor Critical Facility Hazards Summary Report. D. R. deBoisblanc, et al. *Phillips Petroleum Co., Idaho Operations Office (U. S. Atomic Energy Commission),* IDO-16332, Mar. 1957, 94 p. (UF767 Un3.1id Contin.)

Evaluation of hazards and safety measures. Control equipment.

12175 An Analysis of the Reactions Induced in Complex Nuclei by Nucleons With Energies Between 10 and 20 MeV. G. Brown and H. Muirhead. *Philosophical Magazine,* v. 2, ser. 8, Apr. 1957, p. 473-490.

12176 Polarization Effects in the Two-Quantum Annihilation of Positrons. Lorne A. Page. *Physical Review,* v. 106, ser. 2, May 1, 1957, p. 394-398.

12177 Angular Distribution of Gamma Rays Following Coulomb Excitation in Even-Even Nuclei. F. K. McGowan and P. H. Stelson. *Physical Review,* v. 106, ser. 2, May 1, 1957, p. 522-529.

Measurements in Ru^{101}, Pd^{108}, Pd^{110}, Cd^{110}, Cd^{112}, Cd^{114}, Cd^{116}, $Os^{190,192}$, and Pt^{194}.

12178 Neutron-Proton Scattering at 90 Mev. Chung Ying Chih and Wilson M. Powell. *Physical Review,* v. 106, ser. 2, May 1, 1957, p. 539-544.

An investigation of 90 m.e.v. neutrons scattered by protons was conducted with a cloud chamber filled with H or with a mixture of methane and H in a magnetic field of 22,000 gauss. The neutron energy spectrum has a full width at half-maximum of about 30 m.e.v.

12179 Polarization in Proton-Proton Scattering at 130, 170, and 210 Mev. E. Baskir, E. M. Hafner, A. Roberts, and J. H. Tinlot. *Physical Review,* v. 106, ser. 2, May 1, 1957, p. 564-568.

12180 Isobar Model for Meson Production in Proton-Proton Collisions. Saul Barshay. *Physical Review,* v. 106, ser. 2, May 1, 1957, p. 572-585.

A model is considered for single- and double-pion production in which the production takes place via an intermediate state wherein either one or both of the initial nucleons is excited to the isobaric state of J=I=3/2.

12181 Photofission Cross Sections of U^{235}, U^{238}, Th^{232}, Bi^{209}, and Au^{197} at Energies of 150 to 500 Mev. John A. Jungerman and Herbert M. Steiner. *Physical Review,* v. 106, ser. 2, May 1, 1957, p. 585-590.

12182 Diffuse-Surface Optical Model Analysis of Elastic Scattering of 17- and 31.5-Mev Protons. Michel A. Melkanoff, John S. Nodvik, David S. Saxon, and Roger D. Woods. *Physical Review,* v. 106, ser. 2, May 15, 1957, p. 793-801.

12183 Elastic and Inelastic Scattering of High-Energy Electrons by Some ($2p$)-Shell Nuclei on the Intermediate-Coupling Model. M. K. Pal and S. Mukherjee. *Physical Review,* v. 106, ser. 2, May 15, 1957, p. 811-816.

12184 Elastic Scattering of 32 MeV Protons From Gold S. N. Ghoshal and B. B. Baliga. *Physical Society, Proceedings,* v. 70, no. 449A, May 1, 1957, p. 324-330.

12185 Incoherent Scattering of Gamma Rays From the Bound Electrons of Heavy Elements. J. Randles. *Physical Society, Proceedings,* v. 70, no. 449A, May 1, 1957, p. 337-347.

12186 The Scattering of Fast Charged Particles. II. On the Single Scattering of 9.8 MeV Positrons in Xenon. K. R. Allen, E. A. Finlay, M. Lipsicas, D. Major, and K. Phillips. *Physical Society, Proceedings,* v. 70, no. 449A, May 1, 1957, p. 355-360.

Scattering in the angular interval 5 to 40° was investigated using the cloud chamber method.

12187* Quantum Field Theory of Unstable Particles. Huzihiro Araki, Yasuo Munakata, Masaaki Kawaguchi, and Tetsuo Goto. *Progress of Theoretical Physics,* v. 17, Mar. 1957, p. 419-442.

Two methods of renormalization are proposed for unstable particles. One is connected with the resonance in scattering and the other with the time development of the unstable particle state.

12188 Report on the Atom. Gordon Dean. 2nd Ed. 359 p. 1957. Alfred A. Knopf, New York. (TK9145 D34r2)

Review of developments in the Atomic Energy Program of the U. S. Peacetime prospects and uses of atomic energy.

12189 HRP Civilian Power Reactor Conference Held at Oak Ridge, March 21-22, 1956. *Research and Development Division, Oak Ridge Operations Office (U. S. Atomic Energy Commission),* TID-7524, Mar. 1957, 258 p. (UF767 Un3ti Contin.)

Includes papers on reactor design and control, corrosion and materials, chemical processing, chemistry of dilute and concentrated solutions, metallurgy problems, and comparative feasibility and costs of large homogeneous reactors.

12190 Techniques and Equipment Utilized in Low-Temperature Reactor Irradiations. R. R. Coltman, T. H. Blewitt, and T. S. Noggle. *Review of Scientific Instruments*, v. 28, May 1957, p. 375-380.

Details of a cryostat used in hole no. 12 of the graphite reactor at Oak Ridge National Laboratory.

12191 Nuclear Reactions. A. M. Lane. *Reviews of Modern Physics*, v. 29, Apr. 1957, p. 191-199.

A review of recent developments with emphasis on the cloudy crystal ball (or complex potential) model and direct reactions.

12192 A Perturbation Calculation of Properties of the $2p\pi$ State of HeH^{2+}. A. Dalgarno and A. L. Stewart. *Royal Society, Proceedings*, v. 240, ser. A, May 21, 1957, p. 274-283.

12193 (Italian.) Spiral Chronographic Trace-Measurement of Time Periods Less Than a Micro-Second. **Cronografo a traccia spiraliforme per misure temporali inferiori al microsecondo.** F. Demanins and G. Poiani. *Tecnica Italiana*, v. 22, Mar. 1957, p. 69-76.

Applicable to electronic techniques in nuclear physics such as measurements of the half life of unstable particles, and excited states.

12194 High-Energy Particle Data. Beverly Hill Willis and Charles V. Stableford. **I.** *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-2426 (Rev.), Nov. 1956, 87 p. (UF767 U3u Contin.)

Contains graphs of particle kinematics and dynamics.

12195 Scintillation Detection of Very-Low-Energy Gamma Rays. J. C. Hubbs and W. A. Nierenberg. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-3434, June 1956, 7 p. (UF767 U3u Contin.)

Method utilizes scintillation detection with NaI-TlI crystals especially split and mounted for the work, and selected single 5819 or 6292 photomultipliers.

12196 Bevatron Beam Induction Electrodes. Harry G. Heard. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-3609, Feb. 1957, 23 p. (UF767 U3u Contin.)

Design principles, frequency response, ultimate sensitivity, monitoring, and calibration techniques of the system used to detect magnitude and radial position of the primary proton beam. Problems associated with the development of induction electrodes. Analysis of a transistor connected as an emitter follower.

12197 The Effect of Rate of Rise of Magnetic Field on the Acceptance Time of the Bevatron. Harry G. Heard. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-3682, Feb. 1957, 13 p. (UF767 U3u Contin.)

Acceptance time varies inversely with rate of change of magnetic field. Analysis of the variation of the probability of an injected proton's striking the inflector on successive turns shows that the probability of missing the inflector varies slowly with the rate of change of magnetic field.

12198 The Application of Charge Independence to Strange-Particle Reactions. Tsuneyuki Kotani. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-3702, Mar. 1957, 26 p. (UF767 U3u Contin.)

Graphs are shown by which the contributions from various isotopic spin states can be easily compared.

12199 A Simplified Photographic Coincidence Method. Donald G. Gardner and Ronald W. Shideler. *University of Michigan (U. S. Atomic Energy Commission)*, AECU-3397, Apr. 1957, 6 p. (UF767 U3au Contin.)

Method requires a minimum of additional circuitry and gave good results in β-γ coincidence work.

12200 Nuclear Heat Power Systems for Merchant Ships. H. A. Ohlgren, William Niedermair, and Paul Van Mater. *University of Michigan and Maritime Administration (U. S. Atomic Energy Commission)*, M-6159, Dec. 1956, 12 p. (UF767 Un3.1m Contin.)

Examples of technically feasible nuclear power plants, present and future. Arrangement of nuclear heat power sources and associated machinery in a merchant ship hull and its effect upon stability and trim.

12201 Proposed 200,000 Kilowatt Pressurized Water Reactor Plant. Plant Design and Cost Estimate. *Westinghouse Electric Corporation, Atomic Power Division (U. S. Atomic Energy Commission)*, WIAP-12, Mar. 1955, 99 p. (UF767 Un3.1wp Contin.)

12202 Joint Bettis-Kapl Nucleate Boiling Detection Experiment. J. M. Hogan and L. R. Boyd. *Westinghouse Electric Corporation, Atomic Power Division (U. S. Atomic Energy Commission)*, WAPD-168, Feb. 1957, 32 p. (UF767 Un3.1wa Contin.)

Tests of acoustic methods for detection of nucleate boiling indicate that the present experimental hydrophone design is inadequate under these simulated reactor conditions and that boiling detection by sonic methods in a reactor would involve an extensive transducer development and application program.

12203* (Russian.) Emission of Negative Ions From Metallic Surfaces Bombarded With Positive Hydrogen Ions. **Emissiia otritsatel'nykh ionov s poverkhnosti metallov pri bombardirovke polozhitel'nymi ionami vodoroda.** I. M. Mitropan and V. S. Gumeniuk. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, v. 32, Feb. 1957, p. 214-222.

Results of an experimental study of secondary negative ion emission from Al, stainless steel, and Cu targets bombarded by 200 to 1000 k.e.v. hydrogen and deuterium ions.

12204* (Russian.) Fission of U, Rh, Bi, and Tl Induced by High Energy γ-Quanta. **Delenie U, Th, Bi i Tl γ-kvantami bol'shikh energii.** E. V. Minarik and V. A. Novikov. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, v. 32, Feb. 1957, p. 241-246.

Photofission yields of U^{235}, Th^{232}, Bi^{209}, Tl^{204}, and Tl^{200} were measured with an ionization chamber at bremsstrahlung peak energies from 80 to 250 m.e.v.

12205* (Russian.) Investigation of U^{238} Fission γ-Rays in the Energy Region up to 250 kev. **Izuchenie γ-luchei deleniia U^{235} v oblasti energii do 250 kev.** V. V. Skliarevskii, D. E. Formenko, and E. P. Stepanov. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, v. 32, Feb. 1957, p. 256-262.

Most of the fission γ-rays are emitted by fission fragments with life times between 0.5×10^{-9} and 2.5×10^{-9} sec.

12206* (Russian.) Non-Linear Theory of Betatron Oscillations in a Strong Focusing Synchrotron. **Nelineinaia teoriia betatronnykh kolebanii v sinkhrotrone s zhestkoi fokusirovkoi.** Iu. F. Orlov. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, v. 32, Feb. 1957, p. 316-322.

See also: **11085** (concrete shielding); **11087** (ceramic materials for reactors); **11251** (interaction of β particles with organic compounds); **11515** (computer equipment for cross-section data); **11521** (computer applications); **11678** (food irradiation reactor); **11727** (moving plate camera for nuclear research); **11824** (metallurgical problems); **11955** (radiation damage in Ti and Zr); **12014** (production of U-Al foils); **12295** (separation of gaseous mixtures by non-uniform barrier); **12449** (uses of radioisotopes).

OPERATIONS RESEARCH AND MANAGEMENT ENGINEERING

12207* Linear Programming in Practice. Emil Kay and Eric Duckworth. *Applied Statistics*, v. 6, Mar. 1957, p. 26-39.

Linear programming was used to determine the least-cost proportions of new and of recovered metal to be used in making up alloys to specification. The setting up of the matrices, the simplifications evolved, and the organizational consequences are considered.

12208* Human Engineering and Electronics. B. Shackel. *British Communications & Electronics*, v. 4, June 1957, p. 350-355.

Shows how engineering psychology, ergonomics, and human engineering can help the electronics designer to achieve maximum working efficiency in his equipment.

12209 Dynamic Factors in Industrial Productivity. Seymour Melman. 239 p. 1956. John Wiley & Sons, New York. (HD57 M49d)

Determination of reasons for increased industrial productivity. Mechanization of production processes; rise of administrative overhead. Manpower utilization principles.

12210 Elements of Supervision. William R. Spriegel, Edward Schulz, and William B. Spriegel. 2nd Ed. 349 p. 1957. John Wiley & Sons, New York. (HF5549 Sp81e2)

Characteristics of a good supervision; organization fundamentals; interviewing techniques; work planning; promoting and maintaining efficiency of employees; use of records and reports.

12211 How to Organize for New Products. Samuel C. Johnson and Conrad Jones. *Harvard Business Review*, v. 35, May-June 1957, p. 49-62.

How to make the most of a steady stream of new products is the key to continued success.

12212 Planning—Key to Research Success. Robert K. Stolz. *Harvard Business Review*, v. 35, May-June 1957, p. 82-88.

An intelligent definition of top management's objectives and their means of achievement can have a salutary effect on the business as a whole as well as on research.

12213 Human Engineering in Equipment Design. 94 p. 1956. Gage Publishing Company, New York. (TA175 EL25h)

Human factors in design of controls, products, and equipment.

12214 Ideas for Management. Sections individually paged. 1957. Modern Office Procedures, Cleveland. (HD29 Sy87p Vis.)

Papers and case histories presented at the Ninth Annual International Systems Meeting. Papers cover new techniques for office procedures, including cost reduction and use of data processing machines; use of operations research and mathematical programing.

12215 Engineering Evaluation—Tool for Research Management. J. F. Adams, R. O. Nellums, and R. E. Howard. *Industrial and Engineering Chemistry*, v. 49, May 1957, p. 40A-43A.

Preliminary engineering evaluations made at the beginning of a process development program can prevent "blind alleys" in research.

12216 Human Engineering an Aid to Improving Electronic Equipment. Maurice Rappaport. *Institute of Radio Engineers, Transactions on Production Techniques*, PGPT-2, Apr. 1957, p. 6-11. (TK1 In6.6p Contin.)

The human engineer, by his knowledge of human sensory and motor characteristics, by systematic application of fundamental principles of psychology, physiology, and anthropometry, and by application of psychophysiological research techniques, can contribute to the development of compatible and more efficient man-machine systems.

12217 The Scope for Operational Research in Industry. II. Stafford Beer. *Machinery Lloyd (Overseas Ed.)*, v. 29, May 11, 1957, p. 70-79.

Problems and techniques associated with stocks and flow, management and balance, and theory of decision; cybernetics.

12218 Management Accounting for Profit Control. I. Wayne Keller. 435 p. 1957. McGraw-Hill, New York. (HF 5686.C8 K28m)

Coordinated cost accounting and budgetary planning and control procedures which the management accountant uses to guide management, from foremen to president, in their decision making.

12219 Management of Foreign Manufacturing Subsidiaries. E. R. Barlow. 223 p. 1953. Harvard Business School, Boston. (HD 31 B24m)

A study of the management problems of U. S. companies manufacturing in foreign countries through subsidiaries and branches, with particular reference to operations in Mexico.

12220* Business War Games for Executives. A New Concept in Management Training. Franc M. Ricciardi. *Management Review*, v. 46, May 1957, p. 45-56.

Description of decision-making games; goals; training value.

12221 The Rationalization of Industrial Decision Processes. William T. Morris. *Ohio State University, Engineering Experiment Station, Bulletin No.* 163, v. 26, Mar. 1957, 117 p. (TA21 O3b Vis.)

An analysis of "decision-making" theory as applied to engineering problems.

12222* Résumé of Useful Formulas in Queuing Theory. Thomas L. Saaty. *Operations Research Society of America, Journal*, v. 5, Apr. 1957, p. 161-200.

Summarizes some results in queuing which might be of value to investigators applying the theory to operational problems.

12223* Optimum Component Redundancy for Maximum System Reliability. Robert Gordon. *Operations Research Society of America, Journal*, v. 5, Apr. 1957, p. 229-243.

Development of a general mathematical solution for the optimum number of redundant elements in a system, when the reliabilities of the individual components are known.

12224 Proceedings of the Tenth National Conference on the Administration of Research. 142 p. 1957. Pennsylvania State University Press, University Park, Pa. (T58 C76p Vis.)

Evaluation of research administrators and research operations. Operations research studies. Motivation of research workers.

12225* Experimental Disorientation in the Horizontal Plane. Malcolm Piercy. *Quarterly Journal of Experimental Psychology*, v. 9, May 1957, p. 65-77.

Twenty-eight subjects were examined on a visual matching task for their ability to maintain an orientation with respect to a particular direction in the horizontal plane following a voluntary rotary body movement through 180 degrees.

12226 Research and Development in the Corporation. 93 p. 1957. American Institute of Management, New York. (T176 Am35r Over.)

A study of various research departments and corporate research functions. Evaluates the programs of a number of representative companies.

12227 The Sales Supervisor and His Place in Management. Elizabeth Marting and Betsy Smith, editors. 103 p. 1957. American Management Assn., New York. (HD28 Am35s Vis.)

Several papers dealing with responsibilities of the sales supervisor, selection and training programs, effective compensation policies for supervisors, and the supervisor's role in communication between the company and its salesmen.

ORE AND MATERIALS BENEFICIATION

12228 The Rheological Properties of Water Suspensions of Finely Subdivided Magnetite, Galena and Ferrosilicon. G. W. Govier, C. A. Shook, and E. O. Lilge. *Canadian Mining and Metallurgical Bulletin*, v. 50, May 1957, p. 261-268; *Canadian Institute of Mining and Metallurgy, Transactions*, v. 60, 1957, p. 147-154.

Measurements of settling rates and viscosity in heavy media.

12229 Magnesium Extraction Process for Plutonium Separation From Uranium. Irvin O. Winsch and Leslie Burris, Jr. *Chemical Engineering Progress*, v. 53, May 1957, p. 237-242.

High-temperature extraction process for the separation of Pu from nuclear reactor core and blanket materials utilizes molten Mg, which is immiscible with molten U.

12230 Energy-New Surface Relationship in the Crushing of Solids. N. F. Schulz, S. R. B. Cooke, and Edgar L. Piret. *Chemical Engineering Progress*, v. 53, May 1957, p. 254-258.

In studying the crushing of taconite, it was noted that resistance to crushing is independent of temperature, and new surface produced was proportional to energy input.

12231 How FluoSolids Roasting Aids Gold Recovery at Dalny Mine. Philip Rabone. *Engineering and Mining Journal*, v. 158, May 1957, p. 98-104.

Proper roasting of arsenical Au ore in a FluoSolids roaster, combined with a well-integrated flotation, cyanidation, and tailings-scavenging program has resulted in 82.8% Au recovery.

12232 Development of a Modified Char Adsorbent for the Recovery of Uranium From Ore Slurries. Paul Noble, Jr., E. P. Bullwinkel, W. I. Watson, R. A. Carlson, J. C. Huggins, and I. M. Whittemore. *Arthur D. Little, Inc. (U. S. Atomic Energy Commission)*, RMO-2622, June 1956, 74 p. (UF767 U3r Contin.)

Carbon adsorbent is modified with a chelating agent to produce an adsorbent active for U. Several organophosphorus compounds were found suitable as chelating agents. A flowsheet is proposed.

12233 The Adaptation of New Research Techniques to Mineral Engineering Problems. *Massachusetts Institute of Technology, Department of Metallurgy (U. S. Atomic Energy Commission)*, NYO-7705, Jan. 1957, 39 p. (UF767 U3ny Contin.)

Adsorption on Ag_2S surfaces; adsorption of inorganic ions on quartz; ion exchange properties of muscovite; slime coatings; native floatability and crystal structure; solvent extraction of Co and transition metals from thiocyanate solutions; intergranular comminution; thickening and thickeners.

12234* Flotation of Uranium and Pyrite at Vogelstruisbult Gold Mining Areas Limited. F. O. Read, E. H. D. Carman, and C. L. M. Gough. *South African Institute of Mining and Metallurgy, Journal*, v. 57, Feb. 1957, p. 419-458.

Operation of U and pyrite flotation plants; metallurgical aspects; costs.

12235* The Use of the Ion-Exchange Process in the Extraction of Uranium From the Rand Ores With Particular Reference to Practice at the Randfontein Uranium Plant. D. E. R. Ayres and R. J. Westwood. *South African Institute of Mining and Metallurgy, Journal*, v. 57, Feb. 1957, p. 459-521.

12236* (German.) Pressure Leaching of Sulfide Ores. **Drucklaugung von sulfidischen Erzen.** E. Discher and E. Pawlek. *Zeitschrift für Erzbergbau und Metallhüttenwesen*, v. 10, Apr. 1957, p. 158-166.

See also: **11072** (ball mills); **11101** (oxidation of ZnS); **11119** (settling rate of slurries); **11153** (separation of Np); **11203** (analysis of ores); **11216** (extraction of $Th(NO_3)_4$); **11706** (coal preparation).

PHYSICS

12237 Aberrations of Thin Lenses. An Elementary Treatment for Technicians and Students. H. H. Emsley. 352 p. 1956. (QC385 Em84a)

An elementary treatment for technicians and students. Geometrical optics; third order equations for thin lens and system of thin lenses.

12238 Performance of Magnetostrictive Transducers Made of Aluminum-Iron Alloy or Nickel-Copper Ferrite. Voshimitsu Kikuchi. *Acoustical Society of America, Journal*, v. 29, May 1957, p. 569-573.

12239 On the Propagation of Ultrasonic Waves of Finite Amplitude in Liquids. V. A. Krassilnikov, V. V. Shklovskaya-Kordy, and L. K. Zarembo. *Acoustical Society of America, Journal*, v. 29, May 1957, p. 642-647.

Dependence of the ultrasonic absorption coefficient on the intensity was measured in water, ethyl and methyl ethers, toluene, transformer oil, and glycerine by means of the thermal method.

12240* (German.) Sodium Chloride Luminescence. **Zur Lumineszenz von Natriumchlorid.** H. Adler and F. Stegmüller. *Acta Physica Austriaca*, v. 11, no. 1, 1957, p. 31-58.

Thermoluminescence curves and preliminary spectrographic and absorption measurements were used in studying the luminescence of natural NaCl and of samples extracted from a melt. An interpretation of the long wave emission bands is attempted.

12241* (German.) Heat Transfer Between Metallic Surfaces in Contact. **Der Wärmeübergang zwischen bearbeiteten Oberflächen.** Wolfgang Held. *Allgemeine wärmetechnik, Zeitschrift für Wärme- und Kält-und Verfahrenstechnik*, v. 8, no. 1, 1957, p. 1-8.

Contact resistance was determined by measuring heat flow and temperature difference. Properties of the surfaces in contact.

12242* (English.) **Note on a Standard Program for Calculation of One-Electron Molecular Integrals of Overlap Type by Use of the Swedish Electronic Computor BESK.** Stig Flodmark. *Arkiv för Fysik*, v. 11, no. 5, 1957, p. 417-419.

All the combinations of overlap integrals between the hydrogen-like wave functions of 1*s*, 2*s*, 2*p*, 3*s*, 3*p*, and 3*d* types can be calculated by the use of this program.

12243* Free Path Formulae for the Coefficient of Diffusion and Velocity of Drift of Electrons in Gases. L. G. H. Huxley. *Australian Journal of Physics*, v. 10, Mar. 1957, p. 118-129.

12244 Magnetography. The Microscopy of Magnetism. F. G. Foster. *Bell Laboratories Record*, v. 35, May 1957, p. 175-178.

A technique which makes it possible to see the actual orientation of poles and domains on the surface of a magnetic material.

12245 Changes of State. A Mathematical-Physical Assessment. H. N. V. Temperley. 324 p. 1956. Cleaver-Hume Press, Ltd., London. (QC301 T24c)

A critical review of certain recent developments concerning such varied topics as freezing, solubilities, ferromagnetism, superconductivity, condensation of gases, and alloy phenomena.

12246* (English, German, and French.) Encyclopedia of Physics. **Handbuch der Physik. v. XX. Pt. II.** Electrical Conductivity. **Elektrische Leitungsphänomene. v. XXX.** X-Rays. **Röntgenstrahlen.** S. Flügge, editor. 491 and 384 p. 1957. Springer-Verlag, Berlin. (QC21 G27h3 Ref.)

Volume XX deals with semiconductors, ionic conductivity, electrical properties of glass, and electrochemistry. Volume XXX covers generation of X-rays, X-ray spectroscopy and microscopy, and the continuous X-ray spectrum.

12247 The Residual Paramagnetism and Nuclear Magnetic Resonance Spectra of Cobaltic Complexes. J. S. Griffith and L. E. Orgel. *Faraday Society, Transactions*, v. 53, May 1957, p. 601-606.

The temperature-independent paramagnetic contribution to the susceptibility of cobaltic complexes was calculated using the strong-field method.

12248 Determination of the Absolute Quantum Yield of Fluorescent Solutions. G. Weber and F. W. J. Teale. *Faraday Society, Transactions*, v. 53, May 1957, p. 646-655.

Method uses the dipolar scattering of monochromatic light from glycogen solutions as a standard of unit quantum yield against which the fluorescence from a solution with the same apparent optical density for the exciting wavelength is compared.

12249* (Russian.) Theory of Scattering of Waves by the Crystal Lattice of Solid Solutions. **K teorii rasseianiia voln kristallicheskoi reshetkoi tverdykh rastvorov.** V. M. Davilenko, M. A. Krivoglaz, Z. A. Matysina, and A. A. Smirnov. *Fizika Metallov i Metallovedenie*, v. 4, no. 1, 1957, p. 28-35.

Formulas are derived for the probabilities of scattering of various types of waves caused by the random sequence of different atoms at the corners of the crystal lattice.

12250* (German.) A General Solution of Boundary Value Problems of Heat and Electric Energy Transmission. **Zur allgemeinen Lösung von Randwertaufgaben der Übertragung von Wärme oder elektrischer Energie.** L. V. Szalay and K. H. Löcherer. *Frequenz*, v. 11, Apr. 1957, p. 97-106.

A general solution of the heat transmission differential equation under any set of initial conditions by means of the Picone and Amerio method based on functional transformations.

12251* Structural and Magnetic Properties of Solid Solutions of Lithium Ferrite With Cadmium Ferrite and With Lithium Aluminate. Alison E. Carter, P. A. Miles, and A. J. E. Welch. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, Suppl. no. 5, 1957, p. 141-144.

Magnetization and X-ray measurements on Cd-substituted Li ferrite are consistent with a structure in which not more than 1% of the Cd ions enter octahedral sites. In the Al-substituted system, the ion distribution in all cases lies between random replacement of Fe^{+++} ions and their replacement on octahedral sites alone.

12252* The Physical and Chemical Properties of Some Nickel-Zinc Ferrite Compounds. N. C. Tombs and J. Watkins. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, Suppl. no. 5, 1957, p. 145-151.

12253* The Properties of Manganese-Zinc Ferrites and the Physical Processes Governing Them. C. Guillaud. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, Suppl. no. 5, 1957, p. 165-173.

Initial permeability depends on stoichiometry, granular structure, and composition, while the temperature coefficient of permeability is controllable by the addition of small amounts of trivalent metallic impurities.

12254* Magnetic Exchange Mechanisms in Magnesium-Manganese Ferrites. W. P. Osmond. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, Suppl. no. 5, 1957, p. 221-227.

The theory of semicovalent exchange interactions associated with semicovalent O bonds in spinel ferrites can adequately explain the observed magnetic properties of simple ferrites.

12255* Magnetocrystalline Anisotropy in Cobalt-Substituted Magnetite Single Crystals. L. R. Bickford, Jr., J. M. Brownlow, and R. F. Penoyer. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, Suppl. no. 5, 1957, p. 238-244.

The growth of single crystals corresponding to $x=0$, $x=0.01$, and $x=0.04$ in the composition series $Co_xFe_{3-x}O_4$ is described. First- and second-order anisotropy constants of these crystals were determined by the torque method over the temperature range 120 to 450 K.

12256* Crystalline Structure and Magnetic Properties of Ferrites Having the General Formula $5Fe_2O_3 \cdot 3M_2O_3$. F. Bertaut and R. Pauthenet. *Institution of Electrical Engineers, Proceedings*, v. 104, pt. B, Suppl. no. 5, 1957, p. 261-264.

12257 Imperfections in Crystals. I. Lattice Vacancies and Atoms in Interstitial Positions. J. M. Honig. *Journal of Chemical Education*, v. 34, May 1957, p. 224-229.

An elementary review of defects in crystalline solids and basic concepts or principles which are used to explain a variety of experimental observations in the physics and chemistry of the solid state.

12258 Surfaces of Solids. J. A. Morrison. *Journal of Chemical Education*, v. 34, May 1957, p. 230-234.

Summarizes recent studies of the physical nature of solid surfaces and recognizes that real surfaces are imperfect structures.

12259 Anomalous Centrifugal Distortion Coefficients in Linear Polyatomic Molecules. Harald N. Nielsen, Gilbert Amat, and Mark Goldsmith. *Journal of Chemical Physics*, v. 26, May 1957, p. 1060-1066.

The theory of the effect of resonance, in particular Fermi resonance and *l*-type resonance, on the effective centrifugal distortion coefficient of a molecule for a given vibration state is developed and applied to certain cases where *l*-type resonance occurs and to cases where both types occur.

12260 Calculation of the Surface Energies of Alkali Halide Crystals. F. van Zeggeren and G. C. Benson. *Journal of Chemical Physics*, v. 26, May 1957, p. 1077-1082.

Calculations for the (100) and (110) faces of a NaCl-type crystal, the (110) face of a CsCl-type crystal, the (100) faces of NaCl-type alkali halides and the (110) faces of both NaCl and CsCl-type alkali halides.

12261 Zinc Oxide Photoconduction, an Oxygen Adsorption Process. Donald A. Melnick. *Journal of Chemical Physics*, v. 26, May 1957, p. 1136-1146.

Photoconductive rise and decay curves of porous sintered ZnO are studied as a function of time (0.3 to 10^7 sec.), ambient O pressure ($5X10^{-8}$ to 760 mm.), temperature (110 to 373 K), incident light intensity (factor of 10^8), and various cycling procedures in regard to illumination.

12262 Evaporation of Metal Crystals. J. P. Hirth and G. M. Pound. *Journal of Chemical Physics*, v. 26, May 1957, p. 1216-1224.

A mechanism for vaporization of solid metals involving monatomic ledges on metal crystal surfaces is deduced, and an equation is derived for evaporation rate in terms of the dynamics of these ledges.

12263 A Redetermination of the Value of the Faraday With the Iodine Coulometer. I. A Precision Constant Current Apparatus. D. A. MacInnes, Chia-Chih Yang and Alfred R. Pray. *Journal of Physical Chemistry*, v. 61, May 1957, p. 662-664.

Device for obtaining currents constant to about one p.p.m.

12264* Emission Spectra of Actinium. William F. Meggers, Mark Fred, and Frank S. Tomkins. *Journal of Research, National Bureau of Standards*, v. 58, June 1957, p. 297-315.

Small samples of Ac, produced by transmuting radium, were investigated spectroscopically by photographing the spectra of light emitted by the samples when excited in a hollow cathode or in arcs and sparks between Cu or Ag electrodes. Atomic-energy levels, spectral terms, and electron configurations were determined.

12265* Low Temperature Bibliography for the Field of Cryogenics. *Arthur D. Little, Industrial Bulletin, Suppl., No.* 9, Mar. 1957, 8 p.

A compilation of reports issued after 1944 on low-temperature physics, including theoretical and experimental research at temperatures of 20 K and below, together with techniques and equipment applicable to this region.

12266 Review of Heat-Transfer Literature—1956. E. R. G. Eckert, J. P. Hartnett, T. F. Irvine, Jr., and P. J. Schneider. *Mechanical Engineering*, v. 70, May 1957, p. 433-444.

A survey of the literature dealing with the most important developments, modes of heat transfer, and applications of the theory.

12267* (English.) Reciprocal Static Solutions of Field Equations Involving an Asymmetrical Fundamental Tensor. H. A. Buchdahl. *Nuovo Cimento*, v. 5, ser. 10, May 1957, p. 1083-1093.

From any given static solution of the field equations of Einstein's unitary field theory another static solution may be inferred by inspection.

12268 Interferometry for the Far Infrared. John Strong. *Optical Society of America, Journal*, v. 47, May 1957, p. 354-357.

Current effort to apply new interferometric procedures to millimeter waves, and the beginning of plans to use interferometry in a telescope above atmospheric absorption.

12269 The Effect of Added Titanium and Aluminium on the Magnetic Behaviour of α-Ferric Oxide. G. Haigh. *Philosophical Magazine*, v. 2, ser. 8, Apr. 1957, p. 505-520.

12270 Spatial Distribution of Energy Absorbed From an Electron Beam Penetrating Aluminum. F. N. Huffman, J. S. Cheka, B. G. Saunders, R. H. Ritchie, and R. D. Birkhoff. *Physical Review*, v. 106, ser. 2, May 1, 1957, p. 435-440.

12271 Temperature Dependence of Ion Mobilities in Helium, Neon, and Argon. Lorne M. Chanin and Manfred A. Biondi. *Physical Review*, v. 106, ser. 2, May 1, 1957, p. 473-479.

Measurements covered the range 77 to 300 K.

12272 Nuclear Polarization and Impurity-State Spin Relaxation Processes in Silicon. David Pines, John Bardeen, and Charles P. Slichter. *Physical Review*, v. 106, ser. 2, May 1, 1957, p. 489-498.

12273 Precision Measurement of X-Ray Fine Structure; Effects of Nuclear Size and Quantum Electrodynamics. Robert L. Shacklett and Jesse W. M. DuMond. *Physical Review*, v. 106, ser. 2, May 1, 1957, p. 501-512.

12274 Photoelectric Emission From Single-Crystal KI. H. R. Philipp and E. A. Taft. *Physical Review*, v. 106, ser. 2, May 15, 1957, p. 671-673.

Yield curves, obtained after irradiation in the first fundamental absorption band, are similar to those observed on evaporated films and the features are attributed to direct ionization and exciton-induced emission from *F* centers of density 10^{18} cm^{-3}, only 10 times lower than for films.

12275 Luminescence and Symmetry Properties of Color Centers. John Lambe and W. Dale Compton. *Physical Review*, v. 106, ser. 2, May 15, 1957, p. 684-693.

A study of the luminescent emission of *F*, *M*, and *R* centers in NaCl, KCl, and LiF.

12276 Opto-Electronic Properties of Mercuric Iodide. Richard H. Bube. *Physical Review*, v. 106, ser. 2, May 15, 1957, p. 703-717.

The optical and photoelectrical properties of mercuric iodide crystals and layers were investigated, particularly as affected by the phase transformation from tetragonal (low-temperature form) to orthorhombic (high-temperature form) which occurs at 400 K.

12277 The Aberration Permissible in Optical Systems. H. H. Hopkins. *Physical Society, Proceedings*, v. 70, no. 449B, May 1, 1957, p. 449-470.

Method for obtaining the permissible tolerance on aberration is based on the criterion that the response of the system for a given spatial frequency shall not fall below 0.8 of that of a perfect system for the same frequency. It is applied to the cases of defect of focus, astigmatism, spherical aberration, and coma.

12278 Paramagnetic Resonance Absorption in Gadolinium Trichloride. C. A. Hutchison, Jr., B. R. Judd, and D. F. D. Pope. *Physical Society, Proceedings*, v. 70, no. 449B, May 1, 1957, p. 514-520.

The splitting of the ground level $^8S_{7/2}$ of Gd^{3+} in zero magnetic field is small, and has a remarkable temperature dependence. Perturbation mechanisms both linear and quadratic in the crystalline field potential are important.

12279* Magneto-Hydrodynamics of a Finite Rotating Disk. K. Stewartson. *Quarterly Journal of Mechanics and Applied Mathematics*, v. 10, May 1957, p. 137-147.

The effect of a vertical magnetic field on the motion of a shallow dish of Hg, part of whose base is rotating while the rest is fixed.

12280* Two Methods for the Numerical Solution of Moving-Boundary Problems in Diffusion and Heat Flow. J. Crank. *Quarterly Journal of Mechanics and Applied Mathematics*, v. 10, May 1957, p. 220-231.

In one method the boundary is rendered stationary by an appropriate change of variable. In the second method Lagrangian interpolation formulas for non-equal intervals are introduced into finite-difference formulas in order to follow the movement of the boundary.

12281* (Russian.) Photoelectric and Optical Properties of HgI_2. **Fotoelektricheskie i opticheskie svoistva HgI_2.** D. V. Chepur. *Radiotekhnika i Elektronika*, v. 2, Mar. 1957, p. 278-286.

Experimental studies on feasibility of using HgI_2 for photoresistors sensitive to electromagnetic radiation. The effects of visible light, X-rays, and other radiation on the photocurrent were determined.

12282 Relaxation Methods in Theoretical Physics. R. V. Southwell. v. II. 522 p. 1956. Oxford University Press, London. (QA935 S63re)

Solution of biharmonic problems, stress systems in solids, and non-linear problems in hydrodynamics and plasticity.

12283 Relaxation Spectrometry. E. G. Richardson. 140 p. 1957. Interscience Publishers, New York. (QC229 R39r)

Deals with those energetic phenomena which accompany the passage of mechanical displacements through matter. The infrasonic, sonic, and ultrasonic, spectra are considered individually.

12284 Molecular Beams. R. Schnurmann. *Research*, v. 10, May 1957, p. 185-197.

Molecular beams consist of a large number of neutral molecules moving with thermal velocities. They are a tool with which the experimenter can study individual molecules free from interaction with their neighbors, and have been used to verify the fundamental postulates of the kinetic theory of gases.

12285* (English.) **Color Centers in Sodium Iodide.** Kiyoshi Shimizu. *Review of Physical Chemistry of Japan*, v. 26, no. 2, 1956, p. 48-51.

Sodium iodide crystals were synthesized and color centers were produced by electrolysis and by X-ray irradiation.

12286 Statistical Mechanics. A Survey of Recent Lines of Investigation. Léon Van Hove. *Reviews of Modern Physics*, v. 29, Apr. 1957, p. 200-212.

12287 The Determination of Arc Temperatures From Shock Velocities. H. Edels and D. Whittaker. *Royal Society, Proceedings*, v. 240, ser. A, Apr. 24, 1957, p. 54-66 + 1 plate.

Temperatures are determined from the measurement of the velocity of a relatively strong shock wave propagated through an arc. Shock velocities are measured by means of a rotating mirror camera.

12288 Mutual Friction in a Heat Current in Liquid Helium II. I. Experiments on Steady Heat Currents. II. Experiments on Transient Effects. W. F. Vinen. *Royal Society, Proceedings*, v. 240, ser. A, Apr. 24, 1957, p. 114-143 + 2 plates.

12289 High-Frequency Scattering of Electromagnetic Waves. D. S. Jones. *Royal Society, Proceedings*, v. 240, ser. A, May 21, 1957, p. 206-213.

The assumption that the illuminated region and the penumbra of a body scatter independently at high frequencies is used to obtain scattering coefficients for perfectly reflecting convex bodies in plane electromagnetic and sound waves.

12290 On the Susceptibility of a Ferromagnetic Above the Curie Point. C. Domb and M. F. Sykes. *Royal Society, Proceedings*, v. 240, ser. A, May 21, 1957, p. 214-228.

Curvature of the reciprocal susceptibility depends primarily on the lattice structure and little on the type of interaction: there is little variation between the different types of two-dimensional, and different types of three-dimensional lattice, although there is a marked difference between two- and three-dimensional lattices.

12291 Dipole and Quadrupole Polarizabilities of Atoms and Molecules. A. Dalgarno and J. T. Lewis. *Royal Society, Proceedings*, v. 240, ser. A, May 21, 1957, p. 284-292.

12292 Radiation Pressure. George E. Henry. *Scientific American*, v. 196, June 1957, p. 99 + 6 pages.

Light and sound, although apparently intangible, actually exert a tiny pressure on objects in their path. Theoretical and experimental studies of this effect are reviewed.

12293 Electroluminescence of ZnS Single Crystals. Gertrude F. Neumark. *Sylvania Technologist*, v. 10, Apr. 1957, p. 29-34.

Recent measurements of the effect of an electric field on thermoluminescence, indicate strongly that impact ionization is the predominating mechanism.

12294 Tables of Physical and Chemical Constants and Some Mathematical Functions. G. W. C. Kaye and T. H. Laby, compilers. 11th Ed. 233 p. 1956. Longmans, Green and Co., New York. (QC61 K18t11)

12295 Separation of Gaseous Mixtures by a Non-Uniform Barrier. Stephen Prager. *Union Carbide Nuclear Company (U. S. Atomic Energy Commission)*, K-1311, May 1957, 14 p. (UF767 Un3.1k Contin.)

Problem is treated by a perturbation method both for sinusoidal and random fluctuation in the barrier characteristics.

12296 Heat Transfer to Lead Bismuth in Turbulent Flow in an Annulus. R. A. Seban and D. F. Casey. *University of California, Institute of Engineering Research (U. S. Atomic Energy Commission)*, AECU-3164, June 1956, 16 p. (UF767 U3au Contin.)

Tests of the heat transfer to molten Pb-Bi eutectic flowing in an annulus with constant heat input along the outer wall produced results in the range of Peclet numbers from 400 to 1600.

12297 Formation of Reversible Colored Modifications at Low Temperatures by Bombardment With Electrons. Yehuda Hirshberg. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission)*, UCRL-3690, Feb. 1957, 16 p. (UF767 U3u Contin.)

Effects of electron irradiation at low temperatures upon a number of bianthrone and spiropyran compounds.

12298* (Russian.) Contribution to the Theory of Ferromagnetism of Metals and Alloys at Low Temperatures. **K teorii ferromagnetizma metallov i splavov pri nizkikh temperaturakh.** E. I. Kondorskii and A. S. Pakhomov. *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki*, v. 32, Feb. 1957, p. 323-332.

Formulas for the temperature dependence of spontaneous magnetization near absolute zero were obtained for a ferromagnetic lattice consisting of one kind of atoms in the case where the number of electrons with uncompensated spins is larger than the number of atoms and for lattices of binary ordered alloys of various structure.

12299* (Russian.) Some Peculiarities of the Piezoelectric Effect in Barium Titanate Under Steady Conditions. **Nekotorye osobennosti pezoeffekta titanata bariia v staticheskom rezhime.** E. K. Dobrer and K. N. Karmen. *Zhurnal Tekhnicheskoi Fiziki*, v. 27, Mar. 1957, p. 508-512.

Extent and sign of piezoelectric polarization are determined by the values of mechanical force and the intensity of the electric field. The piezoeffect of some hard barium titanate alloys depends on only slightly temperature.

See also: **11061** (determination of Curie points); **11066** (properties of Ni ferrite); **11073** $BaO \cdot TiO_2$ transducers); **11081** (properties of ferrites); **11450** (quantum mechanics); **11569** (color centers in alkali halides); **11608** (Mg-Fe ferrites); **12151** (heat transfer with NaK); **12392** (optics of fibers).

PLASTICS

12300 The Testing of Polyvinyl Chloride Electrical Formulations. G. W. Ashworth, J. R. Darby, W. E. Koerner, and R. H. Munch. *ASTM Bulletin*, no. 222, May 1957, p. TP106-TP109.

New type of test specimen for studying resistivity during water immersion, obviates the time-consuming use of expensive, bulky wire-extrusion equipment; as little as 75 g. of exploratory plasticizers can be studied.

12301 Dialkyltin Compounds With Long-Chained Alkyl Groups as Heat Stabilizers for Polyvinyl Chloride. J. G. A. Luijten and S. Pezarro. *British Plastics*, v. 30, May 1957, p. 183-186.

Comparison of the stabilizing action of 16 dialkyltin compounds with different lengths of alkyl groups.

12302 Acrylic Monomers—Their Chemistry and Applications. E. H. Riddle. *Chemistry in Canada*, v. 9, May 1957, p. 49 + 4 pages.

Development of lower-cost processes for methyl methacrylate and for methyl and ethyl acrylate. Effect of variations in structure of the acrylate and methacrylate ester monomers on properties of the corresponding polymers. Applications for these monomers in relation to the four principal methods of polymerization: bulk, suspension, solution and emulsion, with particular attention to emulsion polymers in the paint field.

12303 The Role of Abnormal Linkages in Polymer Degradation Reactions. N. Grassie. *Chemistry & Industry*, no. 18, May 4, 1957, p. 537-542.

12304 Some Aspects of Chelating and Complexing Resins. J. R. Millar. *Chemistry & Industry*, no. 20, May 18, 1957, p. 606-612.

Includes a bibliography of the development of these resins.

12305 Epoxide Resins. Some Aspects of the Chemistry of Epoxide Resins in Relation to Their Application. P. Bruin. *Chemistry & Industry*, no. 20, May 18, 1957, p. 616-621.

12306 Use of "Zytel" in Aerosol Packaging. William N. Ryan. *Drug and Cosmetic Industry*, v. 80, May 1957, p. 615 + 3 pages.

Zytel nylon resin may soon be satisfying the homemaker's demand for beauty as well as safety in the packaging of aerosol sprays.

12307 The Polymerization of Acrylamide in Aqueous Solution. IV. The Ferric Ion Photosensitized Reaction at 25° C and the Burial-Emergence Cycle. F. S. Dainton and M. Tordoff. *Faraday Society, Transactions*, v. 53, May 1957, p. 666-678.

12308* (German.) The Hardening of Polyester-Catalyst Mixtures and Some of the Factors Influencing Hardening. **Die Aushärtung von Polyesterharz-Katalysator-Gemischen und einige der diese Aushärtung beeinflussenden Faktoren.** P. Maltha. *Fette, Seifen, Anstrichmittel*, v. 59, Mar. 1957, p. 163-169.

Influence of various catalysts, accelerators, promotors, regulators, pigments, and fillers on the hardening of polyesters.

12309 Unplasticized P.V.C. as a Constructional Material in Chemical Engineering. IV. S. Mottram and D. A. Lever. *Industrial Chemist*, v. 33, May 1957, p. 241-245.

Low pressure molding techniques.

12310 Nonisothermal Flow of Viscous Non-Newtonian Fluids. R. E. Gee and J. B. Lyon. *Industrial and Engineering Chemistry*, v. 49, June 1957, p. 956-960.

A mathematical model accurately describes nonisothermal laminar flow of lucite acrylic resin through circular channels.

12311* Electrical Properties of Polymers. R. H. Norman. *Institution of the Rubber Industry, Transactions*, v. 33, Apr. 1957, p. 47-60.

Loss factor and permittivity; resistivity; effects of moisture.

12312* The Irradiation of Unsaturated Polyester Resins. A. Charlesby and V. Wycherley. *International Journal of Applied Radiation and Isotopes*, v. 2, Apr. 1957, p. 26-34.

The effect of ionizing radiation on an unsaturated polyester resin is described. With sufficient radiation, the liquid resin is converted by polymerization to a hard thermoset material without the necessity of applying external heat treatment or the prior addition of a catalyst. The changes induced in typical physical properties by progressively increasing amounts of radiation are described and it is shown that beyond a certain radiation dose no further changes occur.

12313 The Measurement of the Flow Properties of Thermo-Plastics at High Shearing Stresses. R. Hayes and D. A. Lannon. *Journal of Applied Chemistry*, v. 7, Apr. 1957, p. 193-198.

Measurements on polystyrene and polyvinyl chloride at high pressure and high rates of shear in the temperature range 130-220 C show the flow behavior to be non-Newtonian and dependent on the pressure applied, the dependence decreasing with increasing plasticizer content.

12314 Relationship of the Second Virial Coefficient to Polymer Chain Dimensions and Interaction Parameters. T. A. Orofino and P. J. Flory. *Journal of Chemical Physics*, v. 26, May 1957, p. 1067-1076.

12315 Entropy of Mixing of Dilute Polymer Solutions. Alden H. Emery, Jr. *Journal of Chemical Physics*, v. 26, May 1957, p. 1254-1258.

The expression obtained employs a molecular dimension obtained from the intrinsic viscosity, contains no arbitrary constants, and appears to be valid from zero to about 2% polymer.

12316 Stress-Relaxation Behavior of Polyvinyl Acetate Films. Kazuhiko Ninomiya and Hiroshi Fujita. *Journal of Colloid Science,* v. 12, Apr. 1957, p. 204-229.

Extensive stress-relaxation data were obtained on 12 samples of polyvinyl acetate (including 8 fractionated, 2 roughly fractionated, and 2 unfractionated) over a wide range of temperature from 10 to 130 C. A composite master relaxation curve was obtained for each sample, covering the range from glassy consistency to rubbery flow as a function of time.

12317* The Interaction Parameter for Solutions of Nitrocellulose in Acetone. H. Takenaka. *Journal of Polymer Science,* v. 24, May 1957, p. 321-332.

Vapor pressures were measured in all-glass systems over the complete range of concentration, at temperatures from 20 to 60 C, and the interaction parameter calculated.

12318* Molecular Weight-Intrinsic Viscosity Relationship and Molecular Weight Distribution of Low Pressure Polyethylenes. L. H. Tung. *Journal of Polymer Science,* v. 24, May 1957, p. 333-348.

12319* Preparation of Graft Copolymers by the Reaction of Primary Amine-Terminated Polystyrene With Copolymers Containing β-Isocyanatoethyl Methacrylate. Roger K. Graham. *Journal of Polymer Science,* v. 24, May 1957, p. 367-382.

12320* Permeability to Liquids of Polyethylene and Irradiated Polyethylene. Henry A. Bent. *Journal of Polymer Science,* v. 24, May 1957, p. 387-400.

12321* Further Studies on the Pyrolysis of Polytetrafluoroethylene in the Presence of Various Gases. J. D. Michaelsen and L. A. Wall. *Journal of Research, National Bureau of Standards,* v. 58, June 1957, p. 327-331.

Studies at 450 to 500 C. Gases can be divided into three groups, depending on whether they inhibit, catalyze, or exert no effect on the thermal-decomposition process. Fluorine-containing gases, i.e., ClF_3 and IF_5, which are capable of dissociating at the pyrolysis temperatures to give fluorine atoms showed the most marked inhibition yet observed.

12322* (German.) Further Development of Perlon and Recent Knowledge in the Field of the Polyester Fiber "Trevira". **Die weitere Entwicklung des Perlons und neuere Erkenntnisse auf dem Gebiet der Polyester-Faser Trevira.** K. Jehle. *Kautschuk und Gummi,* v. 10, Apr. 1957, p. WT97-WT99.

Effects of mixing procedures and use of various additives. Effect of thermal treatment. Testing methods. Description and uses of the "Trevira" fiber.

12323* (German.) Fundamental Principles of Kneading, Dispersing, and Plasticizing Processes. **Grundsätzliches über Knet-, Dispergier- und Plastifizier-Prozesse.** J. Aeschbach. *Kunststoffe,* v. 47, May 1957, p. 247-250.

12324* (German.) Developments in the Forming of Thermoplastic Sheet. **Fortschritte bei der Formung thermoplastischer Kunststoffplatten.** Gerhard Matulat. *Kunststoffe,* v. 47, May 1957, p. 291-294.

Technical developments in vacuum forming include the combination of different processes for the production of large parts, the use of a pre-forming die, and pneumatic pre-stretching and forming. Information on suitable materials as well as the type and arrangement of suction holes is presented.

12325 Fatigue Properties of Fibrous Glass-Reinforced Plastics Laminates Subjected to Various Conditions. Kenneth H. Boller. *Modern Plastics,* v. 34, June 1957, p. 163 + 11 pages.

Fatigue strength values are presented for six standard and four heat-resistant resin laminates reinforced with glass fibers. Fifty-three S-N curves, representing fatigue data between one thousand and ten million cycles, show the effect on fatigue strength of notching, moisture, fabrics, resins, mean stress levels, angles to warp, and temperatures up to 500 F.

12326 Plastic Laminate Heat Shields. J. G. Stansbury. *Modern Plastics,* v. 34, June 1957, p. 188 + 2 pages.

Highly efficient heat barriers are produced by coating fibrous glass laminates with thin reflective coatings. Physical properties of several laminates are listed.

12327* (English.) **The Heterogeneous Hydrolysis and the Supermolecular Structure of Cellulose.** Olli Ant-Wuorinen and Esko Lehtinen. *Paperi ja Puu,* v. 39, no. 4A, Apr. 1957, p. 151-164.

Establishes that the difficult-to-hydrolyze part of native fiber, cellulose I, obeys a kinetic reaction equation of the first order.

12328* (English.) **Studies of High Polymers by Radioactive Method. II. Self-Diffusion of Polystyrene in Its Dilute Solution.** Shintaro Sugai and Jiro Furuichi. *Physical Society of Japan, Journal,* v. 12, Apr. 1957, p. 369-373.

Self-diffusion coefficient depends approximately upon the mol. wt. of the polystyrene. Molecular extension and the shielding ratio are calculated as a function of the mol. wt.

12329* (German.) Effect of Cu-Organic Compounds on Methacrylate Polymerization. **Über die Wirkung von kupferorganischen Verbindungen auf die Polymerisation von Methakrylaten. II.** Polymerization by Means of Metal-Redox-Systems. **Mitteilung über die Polymerisation mit Hilfe von Metall-Redox-Systemen.** W. Strubell. *Plaste und Kautschuk,* v. 4, Mar. 1957, p. 92.

Study of the catalytic effect of Cu on hydroperoxides and dialkylperoxides. Comparison with the results obtained with Fe, Pb, Co, Ni, Mn, and Hg.

12330 Importance of Mold Rigidity in Injection Molding. R. N. Farris and P. J. Meeks. *Plastics Technology,* v. 3, May 1957, p. 371 + 5 pages.

Factors influencing mold rigidity and their effects.

12331 How to Predict Extruder Performance With Polyethylene. B. H. Maddock. *Plastics Technology,* v. 3, May 1957, p. 385-391.

Steps for the complete prediction of extruder output are developed.

12332* (Polish.) X-Ray Methods of Investigation of the Structure of Polymers and Synthetic Fibers. **Rentgenograficzne metody badania struktury polimerow i wlokien syntetycznych.** A. Ziabicki. *Przemysł Chemiczny,* v. 13, Mar. 1957, p. 143-149.

12333* Problems in the Selection of Extruder Screws. Robert Sackett. *SPE Journal,* v. 13, June 1957, p. 30-34.

General discussion of extrusion variables and equipment design factors.

12334 Technical Data on Plastics. 213 p. 1957. Manufacturing Chemists' Assn., Washington, D. C. (TP986.A2 M31t)

Properties characterizing the various commercially available plastics.

12335 Textbook of Polymer Chemistry. Fred W. Billmeyer, Jr. 518 p. 1957. Interscience Publishers, New York. (QD281.P6 B49t)

Physical chemistry of polymers; kinetics of polymerization. Properties of plastics, fibers, and elastomers.

12336 Development of Craze and Impact Resistance in Glazing Plastics by Multiaxial Stretching. G. M. Kline, I. Wolock, B. M. Axilrod, M. A. Sherman, D. A. George, and V. Cohen. *U. S. National Advisory Committee for Aeronautics, Report* 1290, 1956, 16 p. (TL521 Un3r Vis.)

Effect of stress-solvent crazing on tensile strength of polymethyl methacrylate; critical stress and strain for onset of crazing at various temperatures; effect of mol. wt. on crazing; effect of multiaxial stretching on crazing of polymethyl methacrylate and other acrylic glazing materials.

12337* (Russian.) Regularities in the Effects of Plasticizers on the Properties of Polyvinyl Chloride. **O zakonomernostiakh vliianiia plastifikatorov na svoistva polivinilkhlorida.** Sh. L. Lel'chuk and V. I. Sedlis. *Zhurnal Prikladnoi Khimii,* v. 30, Mar. 1957, p. 412-419.

A formula is given for the determination of effective quantities of different plasticizers, that is, quantities causing a uniform decrease of temperature of vitrification and, consequently, imparting a uniform frost resistance to the composition.

12338* (Russian.) Effect of Nitric Acid on Polymers. **Deistvie azotnoi kisloty na polimery.** A. S. Kuz'minskii and E. V. Shemastina. *Zhurnal Prikladnoi Khimii,* v. 30, Mar. 1957, p. 433-438.

On studying the effect of nitric acid on butadiene polymers, characterized by double bonds in the principal chains and the lateral vinyl groups, as well as on the polyisabutylenes of different mol. wts., nitric acid was shown to cause structural changes manifested by a decreased unsaturation, a detached CO_2, and a loss of solubility. The reaction with HNO_3 is accompanied by nitration of the polymers.

See also: **11126** (polymerization of hydrocarbons); **11244** (polymerization of perfluoropropene); **11465** (vinyl ether polymers); **11474** (polyamide coatings); **11484** (polyvinyl acetate emulsions); **11574** (epoxide resins for potting electronic components); **11728** (acetate movie film); **11740** (plastic turbine blades); **11775** (Teflon bearings); **11780** (frictional properties of polyamides).

POLLUTION AND WASTES

12339 Critical Comparison of Collection Efficiencies of Commonly Used Aerosol Sampling Devices. Conrad Schadt and R. D. Cadle. *Analytical Chemistry*, v. 29, June 1957, p. 864-868.

Studies on sedimentation chambers, an MSA electric precipitator, a Greenburg-Smith impinger, Millipore filters, the Cassella thermal precipitator, and an impactor.

12340 Biological Treatment of Sewage and Industrial Wastes. v. I. Aerobic Oxidation. Joseph McCabe and W. W. Eckenfelder, Jr., editors. 393 p. 1956. Reinhold Publishing Corp., New York. (TD755 C76)

These 33 papers cover: basic biochemical principles underlying bio-oxidation and their applications in activated sludge and trickling filter processes; basic theory of oxygen transfer and its application to the design of aeration equipment; and the design and operation of typical sewage and industrial waste treatment processes.

12341 Disposal of Industrial Waste Materials. 157 p. 1957. Society of Chemical Industry, London. (TD897 So13d Over.)

A symposium on waste materials from various industries, their origin and treatment for re-use or recovery of valuable material, and for the final disposal of solid and liquid residues.

12342 Extension of Useful Life of Exhaust Air Filters After Ammonium Nitrate Loading. R. P. Craig, P. D. Erickson, J. A. Geer, and F. J. Linck, Jr. *Dow Chemical Company (U. S. Atomic Energy Commission)*, AECU-3417, Oct. 1956, 24 p. (UF767 U3au Contin.)

Humidification of the filter bank with steam was found to remove the NH_4NO_3 from the filter pores and reduce the pressure drop across the filter to near its original value.

12343 Evaluation of an Experimental French Wet Scrubber "Solivore". Edward Kristal, Richard Dennis, and Leslie Silverman. *Harvard School of Public Health, Harvard University (U. S. Atomic Energy Commission)*, NYO-4612, Mar. 1957, 50 p. (UF767 U3ny Contin.)

"Solivore" unit consists of single or multiple collection stages, each containing a Venturi tube and two spray generators. The principal collecting mechanism is the impingement of dust particles and water droplets in the spray chamber and Venturi tube.

12344 Electrostatic Mechanisms in Aerosol Filtration by Mechanically Charged Fabric Media and Related Studies. Leslie Silverman, Edward W. Conners, Jr., and David M. Anderson. *Harvard University (U. S. Atomic Energy Commission)*, NYO-4610, Sept. 1956, 54 p. (UF767 U3ny Contin.)

12345 On the Filtration of Aerosols by Filter Models of Various Porosities. Isaiah Gallily. *Journal of Colloid Science*, v. 12, Apr. 1957, p. 161-172.

Filter consists of an array of grids set perpendicularly within a metallic pipe. Each grid is composed of equally spaced similar metallic wires. Filtration of homogeneous, electrically neutral aerosols of dioctyl phthalate was studied at various velocities of flow, radii of particles, and inter-wire distances.

12346* (Italian.) Automatic Control of Blast-Furnace Gas Cleaning Plant With 4 Blowers in an Important Steel Mill. **La regolazione automatica dell' impianto di depurazione ad umido del gas di alto forno in un grande stabilimento siderurgico.** R. Porlezza and M. Valussi. *Metallurgia Italiana*, v. 49, Apr. 1957, p. 290-297.

Distribution by hydraulic control to four gas blowers.

12347 Oak Ridge National Laboratory Process Waste Water Treatment Plant. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, AECU-3370, Feb. 1957, 51 p. (UF767 U3au Contin.)

Preliminary details of a proposed plant for treating the low level radioactive liquid waste from the various laboratory processes.

12348* Cyclone-Precipitator Units 98.5% Efficient. *Plant*, v. 15, May 1957, p. 52-54.

Installation and operation of modern dust collection system for clarifying exhaust from large cement kilns as well as reclaiming some 40 to 50 tons of cement daily.

12349 Methodology in Air-Pollution. J. E. Yocom. *Purdue University, Engineering Extension Dept., Extension Series No.* 91, 1956, p. 570-583.

This condensation of a detailed guide used for setting up air-pollution projects at Battelle describes the setting up of a large-scale area air-pollution study which involves a diverse industrial area and a nearby residential community.

12350 Proceedings of the Eleventh Industrial Waste Conference. *Purdue University, Engineering Extension Dept., Extension Series No.* 91, 1956, 650 p. (TD897 In2p Vis.)

Contains 50 papers on a variety of industrial problems.

12351* A Review of the Literature of 1956 on Sewage, Waste Treatment, and Water Pollution. I. *Sewage and Industrial Wastes*, v. 29, May 1957, p. 497-523.

Covers analytical methods and sewage treatment.

12352* Industrial Wastes Forum. *Sewage and Industrial Wastes*, v. 29, May 1957, p. 541-593.

Includes papers on pilot studies to predict effects of waste on receiving waters, aerobic fermentation studies of spent sulfite liquor, and statistical interpretation of pilot-plant studies.

12353* (Russian.) The Reasons for Formation of Deposits in the Wet Gas-Cleaning Installations. **Prichiny obrazovaniia otlozhenii v apparature mokroi gazoochistki.** F. I. Belan. *Stal'*, v. 17, Apr. 1957, p. 366-369.

Material deposited in the gas-cleaning installations, when smelting ferromanganese, consist mainly of calcium carbonates. To prevent these depositions, it is expedient to use an additional hollow scrubber installed before the gas-cleaning system, for collecting the greater part of the dust contained in the gas.

12354* The Why and How of Sewage Effluent Reclamation. P. H. McGauhey. *Water & Sewage Works*, v. 104, June 1957, p. 265-270.

Need for re-use of sewage effluents. Costs. Present installations employing direct re-use of sewage plant effluents.

See also: **11009** (sampling of bacterial aerosols); **11091** (aerosol bibliography).

RUBBER AND ELASTOMERS

12355 Determination of Unsaturation in Butyl Rubber Using Carbon-14-Labeled Isoprene. L. R. McNall and L. T. Eby. *Analytical Chemistry*, v. 29, June 1957, p. 951-954.

By preparing Butyl rubber from carbon-14-labeled isoprene, samples of known unsaturation can be produced. Determinations of unsaturation were made on these samples by iodine-mercuric acetate addition and by ozonolysis and the results are compared. The drastic iodine-mercuric acetate method is more reliable.

12356 Evaluation of a Microhardness Tester. Ross E. Morris and John M. Holloway. *ASTM Bulletin*, no. 222, May 1957, p. TP113-TP118.

Tests on rubber using an ISO instrument designed for specimens of odd size and shape gave satisfactory readings on specimens as thin as 1/64 in. or with a convex surface having a radius of 1/32 in.

12357 Butadiene-2-Methyl-5-Vinylpyridine Rubbers for General Purpose Use. H. E. Railsback and C. C. Biard. *Industrial and Engineering Chemistry*, v. 49, June 1957, p. 1043-1050.

Fabrication, properties, and applications.

12358* Mixing Characteristics and Use of an Improved Oil-Extended Rubber. E. E. Gale, I. W. E. Harris, and S. C. Kilbank. *Institution of the Rubber Industry, Transactions*, v. 33, Apr. 1957, p. 33-57.

Analysis of dispersibility problem and development of dispersibility; effect of molecular structure on mixing characteristics; applications; typical recipes and test data.

12359* Behaviour of Natural and Synthetic Rubbers at High Temperatures. G. E. Williams. *Institution of the Rubber Industry, Transactions*, v. 33, Apr. 1957, p. 37-46.

Data on the effect of temperature on various physical properties.

12360* Hypalon and Neoprene: Some Outstanding Properties. J. F. E. Ruffell. *Institution of the Rubber Industry, Transactions*, v. 33, Apr. 1957, p. 76-84.

12361* (German.) A Contribution to the Knowledge of Highly Elastic Polymers. **Zur Kenntnis der Vulkanisation hochelastischer Polymerisate. XIII.** Vulcanization of Natural Rubber With Sulphur in the Presence of Mercaptobenzothiazole (II). **Über die Vulkanisation des Naturkautschuks durch Schwefel in Gegenwart von Mercaptobenzothiazol (II).** Otto Lorenz and Elisabeth Echte. *Kautschuk und Gummi*, v. 10, Apr. 1957, p. WT81-WT88.

A study of vulcanization of natural rubber with mercaptobenzothiazole as accelerator in the presence of zinc stearate. Effect of variation in the quantity of accelerator added.

12362 Compounding Rubbers for Resistance to Silicate-Ester Fluids. I. Neoprene WRT. L. E. Novy and R. A. Clark. *Rubber Age*, v. 81, May 1957, p. 265-274.

This compounding study resulted in improved Neoprene WRT compounds for use in contact with silicate-ester type hydraulic fluids at high temperatures. The work showed that rubberlike properties can be maintained for at least 168 hrs. at 400 F by judicious choice of fillers and curatives. The most successful compositions were either partially or totally reinforced with nonblack fillers, plasticized with butyl oleate, and cured with a combination of magnesia, zinc oxide, and NA-22.

12363 How to Apply X-Ray Analysis Techniques to Rubber Problems. Vern W. Palen. *Rubber Age*, v. 81, May 1957, p. 276-278.

12364 Carbon Blacks in Nitrile Rubber Compounds. Z. Rigbi. *Rubber Age*, v. 81, May 1957, p. 284-286.

Blends of MT, SRF, and FEF Blacks are interesting for both technical and economic reasons.

12365 Symposium on Butyl Rubber. *Rubber Age*, v. 81, May 1957, p. 287-296.

Panel discussion held by The Fort Wayne Rubber and Plastics Group on April 10, 1957. Subjects covered include ozone resistance, weatherability, aging, chemical resistance, and dynamic properties.

12366* Determination of Degree of Crosslinking in Natural Rubber Vulcanizates. I-II. L. Mullins, C. G. Moore, and W. F. Watson. *Rubber Chemistry and Technology*, v. 30, Jan.-Mar. 1957, p. 1-26.

Physical values of the average mol. wt. between crosslinks for rubber of infinite initial mol. wt. were obtained by determining the volume fraction of swollen rubber in *n*-decane, and then correcting for the finite initial mol. wt. of the rubber.

12367* Crosslinking and Radiation Effects in Some Natural and Synthetic Rubbers. A. Charlesby and D. Groves. *Rubber Chemistry and Technology*, v. 30, Jan.-Mar. 1957, p. 27-41.

12368* The Vulcanization of Elastomers. VII. The Vulcanization of Natural Rubber With Thiuram Disulfides. IV. Walter Scheele and Peter Stange. **VIII. Disulfides.** Walter Scheele and Horst-Eckart Toussaint. *Rubber Chemistry and Technology*, v. 30, Jan.-Mar. 1957, p. 69-86.

12369* The Heat Treatment of Butyl-Carbon Black Compounds. D. C. Edwards and E. B. Storey. *Rubber Chemistry and Technology*, v. 30, Jan.-Mar. 1957, p. 122-140.

Refers to the system: butyl-furnace black-GMF, with emphasis on the role of polymer gelation in systems of this kind.

12370* Kinetics of Hydrochlorination of Unvulcanized and Vulcanized Latex. M. Gordon and J. S. Taylor. *Rubber Chemistry and Technology*, v. 30, Jan.-Mar. 1957, p. 264-273.

Distinguishes between a surface reaction in an outer shell and a bulk reaction inside the particle.

12371* Structure and Solution Properties of High Molecular Weight Butadiene-Styrene Copolymers. R. B. MacFarlane and L. A. McLeod. *Rubber Chemistry and Technology*, v. 30, Jan.-Mar. 1957, p. 315-325.

12372* Cation and Anion Influence in the Alfin Reagent for the Polymerization of Butadiene. A. A. Morton, I. Nelidow, and E. Schoenberg. *Rubber Chemistry and Technology*, v. 30, Jan.-Mar. 1957, p. 326-333.

Measurements by light scattering show that the molecular weights are seven million or more.

12373* Pyridinium High Polymers—A New Class of Oil-Resistant Synthetic Rubbers. W. B. Reynolds, J. E. Pritchard, M. H. Opheim, and G. Kraus. *Rubber Chemistry and Technology*, v. 30, Jan.-Mar. 1957, p. 338-351.

12374* Development of Magnesia-Loaded Nitrile Rubber Composition for High-Temperature Oil Resistance. R. A. Clark and W. H. Gillen. *Rubber World*, v. 136, May 1957, p. 220-231.

In an effort to develop a nitrile rubber compound to meet certain minimum physical properties after 500 hrs. immersion in a synthetic diester lubricant at 350 F, a magnesia-loaded compound was developed that withstood the severe aging conditions for 168 hrs. Extensive compounding studies with curing systems, antioxidants, plasticizers, softeners, and other materials failed to improve the aging characteristics.

12375* (Russian.) Influence of Vulcanization on Dynamic Elastic Properties of Rubber. **Vliianie vulkanizatsii na dinamicheskie elasticheskie svoistva resin.** E. V. Kuvshinskii and E. A. Sidorovich. *Zhurnal Tekhnicheskoi Fiziki*, v. 27, Apr. 1957, p. 702-706.

Relationship between resilience, elasticity, and temperature.

See also: **11487** (rubbery copolymers from ketones).

SPACE HEATING AND CONDITIONING

12376 Electronic Equipment Cooling by Simultaneous Heat and Mass Transfer. Alvin R. Saltzman, Bruno T. Plizak, and Leonard F. Tomko. *Aeronautical Engineering Review*, v. 16, May 1957, p. 67-74.

A technique for cooling electronic equipment which allows heat to be transferred to an initially high-temperature air stream in such a manner that its exit temperature may actually be lowered below its inlet condition.

12377 Selection of Fan Types. A. N. Rogers. *Air Conditioning, Heating, and Ventilating*, v. 54, May 1957, p. 65-69.

The advantages and disadvantages of the various fan types are presented to help in the selection of the type most suitable for a particular application.

12378* Cascade Corners for Ducts of Circular Cross-Section. N. A. Dimmock. *British Chemical Engineering*, v. 2, June 1957, p. 302-307.

Development of a design of cascade corner for circular pipes; its performance compared with that of bends; recommended method of manufacturing the corners.

TEXTILES, FIBERS, LEATHER, AND PAPER

12379* A Chromatographic Method for the Identification of Amino Aldehyde Finishes on Textiles. Braham Norwick and Erwin Bierig. *American Dyestuff Reporter*, v. 46, May 6, 1957, p. 314-315.

12380* The Tear Strength of Fabrics. Richard Steele. *American Dyestuff Reporter*, v. 46, May 6, 1957, p. 329-335.

Effect of various finishing agents on tear strength as measured by the trapezoid, Elmendorf, and tongue methods.

12381* New Developments in Textile Preservation. P. F. Klens and W. J. Stewart. *American Dyestuff Reporter*, v. 46, May 20, 1957, p. 346-350.

12382* Some Aspects of the Use of 2,2'-Dihydroxy 5,5'-Dichlorodiphenyl Methane as a Textile Fungicide. G. R. F. Rose, M. E. Fraser, and C. H. Bayley. *American Dyestuff Reporter*, v. 46, June 3, 1957, p. 385-390.

Fungicide was evaluated as used with unbleached duck, Oxford cloth, and dyed duck under various conditions.

12383* Applications of Radioactivity in the Textile Industry. Irving A. Berstein. *American Dyestuff Reporter*, v. 46, June 3, 1957, p. P399-P404.

Nature of radioactivity; laboratory investigations with tracer techniques; analytical applications; effects of atomic radiation on fibers and polymers; plant process control.

12384* Heats of Wetting of Modified Collagen and Other Materials. Joseph R. Kanagy and James M. Cassel. *American Leather Chemists Association, Journal*, v. 52, May 1957, p. 248-259.

Modifying collagen by treatment with acetic anhydride, methyl alcohol, or nitrous acid reduces the heat of wetting and the amount of moisture adsorbed under controlled conditions. In general, materials that have a high percentage of hydrophylic groups give the highest heats of wetting.

12385* Practical Bating. The Effect of Bating Variables on Side and Calf Leather Qualities. Robert Stubbings. *American Leather Chemists Association, Journal*, v. 52, June 1957, p. 298-311.

Variables studied include quantity and type of enzyme, temperature and time of bating, and deliming conditions. Results are reported in terms of effects on individual properties of the leather, such as break, temper, drawn grain, etc. The results obtained in 6 different tanneries are in excellent agreement.

12386* Ultraviolet Photometric Methods of Tannin Estimation in Relation to Wattle Extract Utilization. D. G. Roux. *American Leather Chemists Association, Journal*, v. 52, June 1957, p. 319-329.

12387* Paper Chromatographic Analysis of the Napthenic Syntans. Arnaldo N. Roseira. *American Leather Chemists Association, Journal*, v. 52, June 1957, p. 330-335.

Conditions for chromatographic examination of naphthalene syntans were studied, including choice of paper, solvent phase, and developing agent. Basic dyes, particularly Methyl Violet 2B, are suitable developing agents.

12388* Practical Aspects of Chrome Tanning. *American Leather Chemists Association Journal*, Suppl. No. 5, 1957, p. 3-46.

Report of a symposium.

12389 Electricity in the Textile Industries. W. E. Swale. 244 p. 1956. National Trade Press, Ltd., London. (TK4035.T4 SW16e)

Principles involved in the generation and distribution of electricity and the means by which it is applied to the mill or factory. Economic factors are emphasized.

12390* Effect of Cyclic Humidification on Dimensional Stability of Commercial Hardboard. R. A. Currier. *Forest Products Journal*, v. 7, Mar. 1957, p. 95-100.

Standard ⅛ and ¼ in. boards manufactured by seven different processes were subjected to 12 cycles of 30-90-30% relative humidity.

12391* Boring Tests of Particle Board. Robert J. Hoyle, Jr. *Forest Products Journal*, v. 7, May 1957, p. 159-162.

A study of the relationship of r.p.m. and feed speed to the production of well machined holes for dowel joints in wood particle board. Influences on dowel joint strength of particle board density, particle direction, and use of face veneer.

12392 Fiber Optics. I. Optical Properties of Certain Dielectric Cylinders. N. S. Kapany. **II. Image Transfer on Static and Dynamic Scanning With Fiber Bundles.** N. S. Kapany, J. A. Eyer, and R. E. Keim. *Optical Society of America, Journal*, v. 47, May 1957, p. 413-427.

12393* (English.) **The Influence of the Ash Constituents on the Acetylation Behaviour of Pulp.** Hannes Sihtola and Ermo Kaila. *Paperi ja Puu*, v. 39, no. 4A, Apr. 1957, p. 143-150.

Influence of carboxyl groups, the DP of the pulp, moisture, sheet making procedure, and aging on acetylation. Evaluation of results was based on the secondary cellulose acetate.

12394* Short Wavelength Ultraviolet Absorption of Various Lignins and Related Substances. I. A Preliminary Basic Study. T. N. Kleinert and C. S. Joyce. *Pulp and Paper Magazine of Canada*, v. 58, Apr. 1957, p. 154-158.

Comparative investigations show characteristic absorption maxima in the short ultra-violet wave length range which are attributed to the resonating system of the aromatic lignin building units.

12395* Short Wavelength Ultraviolet Absorption of Various Lignins and Related Substances. II. Lignin Determination in Sulphite Pulping Liquors. C. S. Joyce and T. N. Kleinert. *Pulp and Paper Magazine of Canada*, v. 58, May 1957, p. 131-134.

A comparative study of the 2050 and 2800 A absorption of bisulfite cooking liquors indicates that the short wavelength absorption is less influenced by the by-products of cooking and gives a more accurate means of delignification control during cooking.

12396* Laboratory Studies in Sulphite Pulping: The Effect of Species, Base and Liquor Penetration. R. M. Dorland, R. A. Leask and J. W. McKinney. *Pulp and Paper Magazine of Canada*, v. 58, May 1957, p. 135-145.

12397* Industries Dependent on the Chemical Industry. The Pulp and Paper Industry in Australia. H. E. Dadswell and A. J. Watson. *Royal Australian Chemical Institute, Proceedings*, v. 24, Mar. 1957, p. 125-130.

Chemicals used. Production control personal. Research activities. Economic considerations.

12398* A Critical Appraisal of the International Daylight Fastness Test. K. McLaren. *Society of Dyers and Colourists, Journal*, v. 73, Apr. 1957, p. 121-160.

Test appears reliable provided it is carried out in a climate similar to that in which the fabric will be used. Experimental data for numerous dye-fiber systems are reported.

12399* The Dyeing of Cellulose Acetate With Disperse Dyes. VI. Affinities, Heats of Dyeing, and Heats of Solution. C. L. Bird and P. Harris. *Society of Dyers and Colourists, Journal*, v. 73, May 1957, p. 199-202.

The partition of disperse dyes between water and cellulose acetate was studied by means of desorption experiments and the results used to calculate values for affinity, heat of dyeing, and entropy change.

12400* A Study of the Mechanism of Fatty Spue Formation. I. R. G. Mitton and K. G. A. Pankhurst. *Society of Leather Trades' Chemists, Journal*, v. 41, Apr. 1957, p. 128-155.

Studies of the method by which fatty materials migrate through leather to see how far this can be regulated by the normal operations of leather manufacture.

12401* (English.) **Studies on Finely Divided Wood. III. Extraction of Lignin-Carbohydrate Complexes With Neutral Solvents.** Anders Björkman. *Svensk Papperstidning*, v. 60, Apr. 15, 1957, p. 243-251.

"Lignin-carbohydrate complexes" were extracted in high yields by dimethylformamide, dimethylsulfoxide, and aqueous acetic acid from finely divided wood after the extraction of "milled wood lignin".

12402* (English.) **Studies on Finely Divided Wood. IV. Some Reactions of the Lignin Extracted by Neutral Solvents From *Picea Abies*.** Anders Björkman and Börje Persson. *Svensk Papperstidning*, v. 60, Apr. 30, 1957, p. 285-292.

The composition of "milled wood lignin" and of its thiobenzhydrazide and thioglycolic acid derivatives are compared.

12403* The Effect of Chlorine in Chlorine Dioxide Solutions for Bleaching Pulp. W. H. Rapson and C. B. Anderson. *Tappi*, v. 40, May 1957, p. 307-311.

The addition of Cl to the ClO_2 solutions used to bleach pulp at pH 6, which is best for ClO_2 and worst for Cl when used alone, causes no significant damage to the pulp up to about 25% of the weight of the ClO_2 used.

12404* A Method for Routine Measurement of the Ply-Bond Strength of Paperboard. John F. Donahue, Jr. and H. W. Verseput. *Tappi*, v. 40, May 1957, p. 311-313.

12405* Recycling Liquor Systems for Cold Soda Pulping. P. K. Baird, Giorgio Ceragioli, and K. J. Brown. *Tappi*, v. 40, May 1957, p. 314-325.

Comparative data on two countercurrent systems for the reuse and recycling of pulping liquors and wash waters in the cold soda pulping of aspen (*Populus tremuloides*) were determined. An accelerated batch pulping process, used in both systems, consisted of impregnating pre-evacuated chips with solutions of sodium hydroxide at room temperature for 10 min. under a hydrostatic pressure of 11 atm.

12406* The Flow Characteristics of Dilute Fiber Suspensions. A. A. Robertson and S. G. Mason. *Tappi*, v. 40, May 1957, p. 326-334.

The flow of dilute (0 to 1%) suspensions of fibers in a long ⅜-in. I. D. glass tube was investigated as the first step in a study of the flow characteristics of pulp suspensions with particular reference to the mechanisms of flow and the role of fiber properties.

12407* A Polymer-Homologous Series of Beta-D-Acetates From Cellulose. M. L. Wolfrom and D. L. Fields. *Tappi*, v. 40, May 1957, p. 335-337.

A polymer-homologous series of β-D-oligosaccharide acetates from cellulose complete from β-cellobiose octaacetate through β-cellohexaose eicosaacetate were obtained and characterized. They were prepared from their anomers by a stereospecific conversion reaction.

12408* (Swedish.) Testing Paper. **Provning av papper.** Olle Andersson and Jan Bergström. *Teknisk Ukeblad*, v. 104, Apr. 18, 1957, p. 315-320.

A description of tests used in determining paper strength under various strains such as pull, tearing, folding, and shockload, and in measuring paper rigidity, softness, dimensional stability, surface smoothness, and permeability.

12409* The Gravimetric Estimation of Medulla in Wool. D. A. Ross and J. B. Speakman. *Textile Research Journal*, v. 27, May 1957, p. 345-351.

A gravimetric estimation of the amount of medulla in wool can be made by determining the amount of residue left after samples of known dry weight have been treated with a 1.6% solution of peracetic acid for 48 hrs. at 25 C, followed by a 1.0 *N* solution of ammonia for 24 hrs. at 25 C. A correction must be applied for the amount of residue given by non-medullated wools, which is approximately the same for Merino and crossbred wools.

12410* The Mechanism of Carrier Action in Dyeing Dacron Polyester Fiber. M. J. Schuler. *Textile Research Journal*, v. 27, May 1957, p. 352-358.

12411* The Application of Fluorochemicals to Cotton Fabrics to Obtain Oil and Water Repellent Surfaces. Frederick J. Philips, Leon Segal, and Leopold Loeb. *Textile Research Journal*, v. 27, May 1957, p. 369-378.

Commercial and laboratory preparations of poly (fluoroalkyl esters of acrylic acid) and of Cr complexes of fluorine-containing monocarboxylic acids were used to treat cotton fabrics, thereby substituting low energy—CF_3 and CF_2—groups for —H, —OH, and —CH_2OH of the cellulose surface of the cotton fibers.

12412* The Interpretation of Creep Failure in Textile Fibers as a Rate Process. Bernard D. Coleman and Andrew G. Knox. *Textile Research Journal*, v. 27, May 1957, p. 393-399.

Some theoretical results are presented which have been obtained using an absolute reaction rate approach for discussing the time dependence of creep failure in textile fibers.

12413* How Londat Aetz Co. Produces Soluble-Cotton Fabrics. *Textile World*, v. 107, May 1957, p. 108 + 3 pages.

Production of fabric that is soluble in 8% caustic soda, adequately strong for the purpose, and no more flammable than ordinary cotton.

12414* (German.) Sisal, Raw Material of the Molded Fiber Industry; Preparation and Processing. **Sisal, Rohstoff der Hartfaserindustrie-seine Aufbereitung und seine Verarbeitung.** Hans Paul. *VDI Zeitschrift*, v. 99, Apr. 1957, p. 467-469.

Description of the apparatus and processes used in making yarns, twines, and fabrics of sisal fiber.

See also: **11116** (swelling of cellulose); **11296** (properties of aminoazobenzene dyes); **11461** (concentrated viscose solutions); **11777** (beta-ray gauges for paper mills); **11800** (mechanized handling equipment); **12322** (polyester fiber properties); **12332** (X-ray studies of fiber structure).

WELDING AND JOINING

12415 Adhesive Bonding of Magnesium. R. J. E. Hunter. *Aircraft Production*, v. 19, May 1957, p. 198-201.

Bonding process incorporates a corrosion-resistant hot-alkaline chromate treatment as the surface preparation and is intended for service at elevated temperatures.

12416 Rocket-Motor Tubes. *Aircraft Production*, v. 19, June 1957, p. 222-230.

Argon arc-welding of high strength steel sheets during manufacture of rocket-motor boost-units.

12417 Autoclave Bonding. N. Evans. *Aircraft Production*, v. 19, June 1957, p. 240-249.

Use of fluid pressure in the production of adhesive-joined assemblies.

12418 New Developments in the Welding of Heavy-Gage Steel Plate. M. M. Fishkis, V. K. Kalenskii, and I. V. Red'ko. *Henry Brutcher Translation No.* 3774, 6 p. (From *Avtomaticheskaya Svarka*, v. 8, no. 5, 1955, p. 74-77.) Henry Brutcher, Altadena, Calif.

Development of high-efficiency three-electrode semi-automatic welding guns for steel plate from 1½ to 7 inches thick. Design and application of equipment.

12419 Technology of Arc Welding of Light-Gage Sheet Steel in a Carbon Dioxide Atmosphere. F. E. Tret'yakov, A. B. Karan, and S. N. Valeev. *Henry Brutcher Translation No.* 3779, 8 p. (From *Svarochnoe Proizvodstvo*, no. 5, May 1956, p. 20-22.) Henry Brutcher, Altadena, Calif.

Previously abstracted from original. See item 10315, v. 5, Aug. 1956.

12420* Iron Powder Electrodes: Success or Failure? D. L. Mathias. *Industry & Welding*, v. 30, June 1957, p. 55 + 4 pages.

Some pros and cons of their use.

12421* Brazing Helps Build Rockets and Missiles. C. Jewett Crites. *Industry & Welding*, v. 30, June 1957, p. 113-117.

Brazed stainless steel honeycomb structures give high strength-to-weight ratios and resistance to supersonic heats.

12422 Intermediate Indalloy Solders. 58 p. 1954. Indium Corporation of America, New York. (TT267 In2i)

Characteristics of various metals alloyed with In. Physical properties of Indalloy solders. The versatile role of In as a solder for metals and non-metals.

12423 Resistance Welds Bypass Oxide Barrier. J. J. Obrzut. *Iron Age*, v. 179, June 6, 1957, p. 97-99.

"Thermatool" process uses high-frequency power to its best advantage. The current travels into metal by capacitive action, requires little special preparation.

12424 Welding Stainless Steels. Richard E. Paret. *Machinery*, v. 63, June 1957, p. 185-192.

Characteristics of the various alloys and recommended welding methods.

12425 Remote Welding of Stainless Steel Containers. E. E. Pierce. *Oak Ridge National Laboratory (U. S. Atomic Energy Commission)*, ORNL-2280, Apr. 1957, 8 p. (UF767 U3o Contin.)

Equipment for sealing stainless steel cylinders containing radioactive materials by remotely operated-shielded-arc welding.

12426 Small Parts Assembly Simplified With Single-Component Epoxy Adhesives. Bernard Gould. *Product Engineering*, v. 28, May 1957, p. 164-166.

Paste adhesive developed for non-aircraft use has moderate tensile shear strength to 250 F, retains form during curing, and requires no hardener.

12427 Recommended Practice for Repair Welding and Fabrication Welding of Steel Castings. 58 p. 1957. Steel Founders' Society of America, Cleveland. (TK4660 St32r Over.)

Contains the results of a research project conducted by Battelle Memorial Institute to provide a single handy reference manual. Includes concise but comprehensive data on electrodes, preparation for welding, welding methods, and effects of welding on carbon and low-alloy steel castings.

12428* (German.) Autogenous Relaxation. **Autogenes Entspannen.** H. G. Kunz. *Schweisstechnik*, v. 11, Feb. 1957, p. 13-19.

Description of relaxation in welding steel. Deformation mechanism. Measuring relaxation. Practical application to tank construction.

12429* (German.) Modern Equipment for the Electric Resistance Welding of Light Metals. **Moderne Einrichtungen zur elektrischen Widerstandsschweissung von Leichtmetallen.** K. G. Gabler. *Schweisstechnik*, v. 11, Mar. 1957, p. 28-30.

A survey of electronic equipment (ignitron and thyratron systems, etc.) used in spot, seam, and butt welding operations.

12430* (French.) Contribution to the Study of the Control of Voltage, Strain, and Time Parameters in Resistance Spot Welding. **Contribution à l'étude du contrôle des paramètres —tension, intensité, effort, temps—en soudage par résistance par points.** M. Evrard and C. Haslé. *Soudage et Techniques Connexes*, v. 11, Mar.-Apr. 1957, p. 69-75.

Method is based on the use of a stylus type oscillograph which is connected to various devices for the determination of welding parameters.

12431* (Russian.) Investigation of Titanium Weldability. **Issledovanie svarivaemosti titana.** M. Kh. Shorshorov, G. V. Nazarov, and T. A. Amfiteatrova. *Svarochnoe Proizvodstvo*, no. 4, Apr. 1957, p. 1-5.

Deterioration of properties and structure of the base metal in the zone around the joint. Grain growth in the seam and the surrounding zone. Plastic properties of welded joints.

12432* (Russian.) Adsorption of Mn, Si, G and C During Welding of Steel (30KhGSA) Under Flux. **Usvoenie margantsa, kremniia, khroma i ugleroda pri svarke stali (30Kh GSA) pod fliusom.** N. T. Azarenko. *Svarochnoe Proizvodstvo*, no. 4, Apr. 1957, p. 9-12.

A study of the reaction of metal and slag during automatic welding. Chemical composition of the flux and basic metals in the electrode wire. Behavior of the various metals during welding. Carbon combustion. Formation of ferrous salt in the slag.

12433 Fundamentals of Diffusional Bonding. I. L. Castleman and L. Seigle. *Sylvania Electric Products, Inc. (U. S. Atomic Energy Commission)*, SEP-227, Aug. 1956, 38 p. (UF767 Un3.1se Contin.)

Diffusion bonding in the Al-Ni alloy system in the temperature range 400-625 C occurs by the formation and growth of the Ni_2Al_3 (γ) and the $NiAl_3$ (β) layers. Other phases are either not present or occur in submicroscopically thin layers.

12434* For Better Brazing, Start With the Fundamentals. Lester F. Spencer. *Tooling and Production*, v. 23, May 1957, p. 99-103.

Brazing principles and procedures. Relationship between strength and joint characteristics. Costs.

12435 Tig for the Metals that "Couldn't be Welded". Jack Fairlie. *Welding Engineer*, v. 42, June 1957, p. 32-37.

Describes torch and electrodes. Current selection for various types and thicknesses of metals. Operational problems.

12436 Evaluation of Weld-Joint Flaws as Reinitiating Points of Brittle Fracture. D. C. Martin, R. S. Ryan, and P. J. Rieppel. *Welding Journal*, v. 36, May 1957, p. 244s-251s.

Influence of various types and sizes of flaws in welded butt joints on the initiation of brittle fractures were studied under conditions closely simulating those found in service. It was found that brittle fractures initiate from weld defects in laboratory specimens under conditions similar to the reported conditions involved in some service failures of ships.

12437 Regulated and Programmed Resistance-Welding Control Systems. C. Sinclair and F. S. Parker. *Welding Journal*, v. 36, May 1957, p. 463-465.

Development of a new current regulator which can be programmed by a slope control to give a regulated sloped current wave for welding.

12438 Developed Procedures for the Flexible-Electrode Submerged-Arc Welding Process. M. H. Fritsche. *Welding Journal*, v. 36, May 1957, p. 466-474.

Printed procedures used at the welding station, together with accurate metering on the welder, produce maximum metal deposit on as-received material.

12439 Manual Magnetic-Flux Gas-Shielded Arc Welding of Mild Steel. N. Davis and R. T. Telford. *Welding Journal*, v. 36, May 1957, p. 475-480.

New process is capable of producing high-quality welds in mild steel in all positions at greater welding speeds and lower welding cost than covered electrodes.

12440 Elevated Temperature Resistant Silicone Structural Adhesives for Metals. Frank J. Riel, Jr. and M. Bruce Smith. *Wright Air Development Center, Materials Laboratory, WADC Technical Report* 56-533, Mar. 1957, 36 p. (TL507 Un3.18w Vis.)

Evaluation of carboxyphenyl polysiloxanes showed them to be better high temperature resistant laminating resins than high temperature resistant metal-to-metal adhesives when compared with conventional commercially available silicones. The most promising contains 25/27 di/trifunctional monomer, 50/50 phenyl/methyl, and 10 mole % total groups.

12441* (Slovak.) Investigation of the Temperature Fields in Open-Arc Welding. **Výskum tepelných polí pri zváraní s odkrytým oblúkom.** Andrej Havalda. *Zváranie*, v. 6, Apr. 1957, p. 97-102.

Experimental results in studying temperature kinetics in arc welding and investigation of the individual temperature fields under various technical conditions; effects of some welding parameters on the general temperature of the process.

12442* (Slovak.) Argon Arc Welding of Pipes. **Oblúkové zváranie rúrok v argóne.** Ján Novotný. *Zváranie*, v. 6, Apr. 1957, p. 115-119.

Welding in a protected atmosphere applied to pipes. Preparation of built-up edges. Defects in welds. Application to a Mn-Cr-Ti steel.

See also: **11868** (high-temperature brazing alloys); **11994** (tests on submerged-arc weld deposits); **11995** (properties of steel weld metal); **12066** (ferrite phase in steel welds); **12089** (testing of welds in ships); **12093** (inspection of welds).

MISCELLANEOUS

12443* Multistage Statistical Decision Procedures. M. A. Girshick, S. Karlin, and H. L. Royden. *Annals of Mathematical Statistics*, v. 28, Mar. 1957, p. 111-125.

12444* On a Characterization of the Normal Distribution From Properties of Suitable Linear Statistics. R. G. Laha. *Annals of Mathematical Statistics*, v. 28, Mar. 1957, p. 126-139.

12445* Analysis and Presentation of the Results of Factorial Experiments. Anthony G. Baker. *Applied Statistics*, v. 6, Mar. 1957, p. 45-55.

Method is particularly suitable for use with a desk calculating machine and is applicable to either qualitative or quantitative factors.

12446* Aluminum in the Environment of Man. A Review of Its Hygienic Status. Irene R. Campbell, Jules S. Cass, Jacob Cholak, and Robert A. Kehoe. *Archives of Industrial Health*, v. 15, May 1957, p. 359-448.

History of the development and uses of Al and of the principal Al minerals. Physical and chemical characteristics and analysis of Al. Occurrence in the normal environment. Aluminum in food, in food processing, and in the body.

12447 (English, French, and Spanish.) **Arid Zone Research. v. VII. Wind and Solar Energy, Proceedings of the New Delhi Symposium.** 238 p. 1956. Unesco, Paris. (TJ825 Un2w)

These papers deal with pertinent research, machinery, power plants, power utilization, and related topics, with particular reference to arid zone problems.

12448* Supermarkets 1967 Style. D. E. S. Isle. *Automation*, v. 2, Apr. 1957, p. 411-413.

Prospects for automatic procedures. Use of punched cards.

12449* (Dutch.) Radioisotopes. **Radioisotopen. VII.** Research Methods Using Tracers. **Veel onderzoekingsmethoden mogelijk met tracers.** T. van der Klis. *Bedrijf en Techniek*, v. 12, no. 277; *Electronica section*, v. 10, no. 224, Apr. 20, 1957, p. 57 + 6 pages.

Tracer techniques. Application to various processes such as controlling mixtures, and studies of wear, corrosion, purification, diffusion, and precipitation.

12450* The Asymptotic Solution of Differential Equations With a Turning Point and Singularities. R. C. Thorne. *Cambridge Philosophical Society, Proceedings*, v. 53, pt. 2, Apr. 1957, p. 382-398.

12451* A Numerical Method of Solving Second-Order Linear Differential Equations With Two-Point Boundary Conditions. E. Cicely Ridley. *Cambridge Philosophical Society, Proceedings*, v. 53, pt. 2, Apr. 1957, p. 442-447.

12452* Safety in Handling Caustic Soda. N. L. Evans. *Chemical & Process Engineering*, v. 38, May 1957, p. 175-180.

Precautions to be taken during handling, transport and storage; some remarks on treatment of burns and eye injuries.

12453 Differential Equations Applied in Science and Engineering. Harold Wayland. 353 p. 1957. D. Van Nostrand Co., Princeton, New Jersey. (QA401 W36d)

A systematic development of the interrelation of classical analysis and those physical concepts in science and engineering which can be described in terms of differential equations.

12454* Capsule Calculus. Ira Ritow. *Electrical Manufacturing*, v. 59, May 1957, p. 107-126.

Refresher course covers basic principles of calculus, differentiation and its uses, integration and its applications, use and meaning of differentiation and integration with respect to time, and equations of motion.

12455 Foundations. Design and Practice. Elwyn E. Seelye. Sections individually paged. 1956. John Wiley and Sons, New York. (TA775 Se35f)

Provides up-to-date information on all phases of foundation work, including subsurface exploration, inspection, foundation reports, specifications, estimates, contracts, and design.

12456* A Mathematical Tool in Industry: An Algorithm for Curve Fitting by the Method of Least Squares. Leo Marcus. *General Motors Engineering Journal*, v. 4, Apr.-May-June, 1957, p. 16-21.

New method of curve fitting has made it possible to fit an analytical equation using more than one independent variable. The method has proven very useful in extrapolating the operational characteristic data of a turbo-prop control system.

12457* The Importance of Keeping Records of Inventions. Alfred E. Wilson. *General Motors Engineering Journal*, v. 4, Apr.-May-June, 1957, p. 48-49.

Value of prompt prosecution of claims is also stressed.

12458 Group Dynamics. Research and Theory. Dorwin Cartwright and Alvin Zander, editors. 642 p. 1956. Row, Peterson and Co., Evanston, Ill. (HM131 C24g)

Collection of reports on group functions and group patterns in society. Tells why things happen as they do in families, clubs, committees, workteams, classrooms, military units, business and industrial meetings, and other types of groups that make up our social fabric. Deals with such problems as group leadership, group effectiveness, the setting of group goals, communication within groups, the consequences of hierarchical organizations, and the relations between groups and individual members.

12459 Introduction to Statistical Analysis. Wilfrid J. Dixon and Frank J. Massey, Jr. 2nd Ed. 488 p. 1957. McGraw-Hill, New York. (HA29 D64i2)

Textbook for a basic course in statistics, intended for students from all fields in which statistics finds application.

12460 It Could Happen Only in the U. S. Benjamin F. Fairless. 54 p. 1957. Time, Inc., New York. (TS303.5 F16i)

Mr. Fairless' own account of his career from modest beginnings as a coal miner's son to the position of chief executive officer of the United States Steel Corp.

12461* Effect of Control Lag on Performance in a Tracking Task. Jack E. Conklin. *Journal of Experimental Psychology*, v. 53, Apr. 1957, p. 261-268.

Lag was introduced by two different filter networks, a single RC network (asymptotic lag), and two RC networks in cascade. Test results support the assumption predictive behavior on the subject's part is essential for skilled performance.

12462* Effects of Foreperiod, Induced Muscular Tension, and Stimulus Regularity on Simple Reaction Time. Warren H. Teichner. *Journal of Experimental Psychology*, v. 53, Apr. 1957, p. 277-284.

12463* Performance in Following Tracking as a Function of the Sensitivity of the Airplane-Type Control Stick. B. G. Andreas, A. A. Gerall, R. F. Green, and D. P. Murphy. *Journal of Psychology*, v. 43, Apr. 1957, p. 169-179.

12464 Principles and Techniques of Applied Mathematics. Bernard Friedman. 315 p. 1956. John Wiley & Sons, New York. (QA37 F91p)

Analysis of linear spaces; spectral theory of operators; Green's functions; eigenvalue problems; partial differential equations.

12465 The Problems of Vision in Flight at High Altitude. Thomas C. D. Whiteside. 162 p. 1957. Butterworths Scientific Publication, London. (TL555 W58p)

Effects of changes in intensity and spectral distribution of sunlight at high altitude. Physiological changes affecting visibility of objects inside the cockpit and affecting air-to-air visibility.

12466 Proceedings of Symposium on Preservation for Mobilization Requirements. 529 p. 1956. U. S. Naval Civil Engineering Research and Evaluation Laboratory, Port Hueneme, Calif. (TA462 Un3.5p)

Papers deal with methods for storing military vehicles and other equipment in a state of immediate readiness.

12467* (Polish.) Investigation of Absorption and Removal of Carbon Disulfide From the Human Body. **Badanie nad pochłanianiem i wydalaniem dwusiarczku węgla przez organizm ludzki.** H. Demus. *Przemysł Chemiczny*, v. 13, Mar. 1957, p. 159-162.

Relation between CS_2 absorption and its content in air. Effect on the human organism. Establishing a laboratory method for checking blood samples for CS_2 content.

12468 Radiation: What It Is and How It Affects You. Jack Schubert and Ralph E. Lapp. 314 p. 1957. Viking Press, New York. (QH652 Sch78r)

An authoritative discussion of the various sources of radiation and its known or likely effects on human beings.

12469 Rational Organisation of Industrial Research. 68 p. 1956. European Productivity Agency, Paris. (T175 Qr3.2r)

Proceedings of a conference designed to provide those responsible for research services with an opportunity to make a joint study of economic and organizational factors of prime importance in the rational management of an applied research laboratory.

12470 Recent Advances in Radiology. Thomas Lodge. 3rd Ed. 358 p. 1955. J. & A. Churchill, Ltd., London. (RC78 L82r)

Developments in radiological examination of bones, joints, cardio-vascular system, lungs and other organs.

12471 Report of an International Conference on Operator Theory and Group Representations. 36 p. 1955. National Academy of Sciences, National Research Council, Washington, D. C. (QA253 In8r)

Papers on subnormal operators, operator algebras, group representation, linearly perturbed operators, and on an inequality for linear operators in a Hilbert space.

12472* An Alignment Matrix and Its Applications to Plane Cubic Curves and Their Rational Points. A. Gutwirth and E. Jabotinsky. *Research Council of Israel, Bulletin,* v. 6A, Oct. 1956, p. 11-41.

A three-by-three matrix whose elements belong to a commutative field and satisfy seven equations is defined, and its properties are established. Application is made to configurations on plane cubics, their metrical properties, and their parametrical representation by elliptic functions.

12473 A Short Introduction to Archaeology. V. G. Childe. 142 p. 1956. Frederick Muller, Ltd., London. (CC165 C43s)

Classification of specimens; archaeological sites and their stratigraphy; hints on recognition of monuments in the field; interpreting archaeological data.

12474 The Control of Mercury Vapor in Laboratories. C. R. Wintersteen. *University of California, Radiation Laboratory (U. S. Atomic Energy Commission),* UCRL-3714, Mar. 1957, 11 p. (UF767 U3u Contin.)

An outline of general safety procedures.

See also: **11096** (statistical methods in chemical engineering); **12167** (nuclear engineering educational programs).